

# FSA203 — Multimedia High-Speed USB, Video, and Negative Swing Audio Switch with Video Amp/Filter

## Features

- USB: 3.5Ω Typical On Resistance
- Video/Mic: 3Ω Typical On Resistance
- Audio: 3.5Ω Typical On Resistance
- USB: -3db Bandwidth at 0pF > 745MHz
- Video: -3db Bandwidth > 615MHz
- Video: 1.0db Flatness > 6MHz
- Low-Power Shutdown Mode: 1μA Maximum
- Power-Off Protection on Common D+/R, D-/L, Video/Microphone Ports
- Packaged in Pb-free 20-Lead DQFN

## Applications

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

## Description

The FSA203 is a multimedia device that includes a Double-Pole, Double Throw (DPDT) USB / audio multiplexer, a video/microphone switch, and a video amplifier / filter path. The DPDT path combines a low-distortion audio and a USB2.0 switch path.

This configuration enables audio and USB data to share a common connector port. The architecture is designed such that audio signals are allowed to swing below ground, enabling the use of a common USB and headphone connector for personal media players and similar portable peripheral devices.

The FSA203 includes a power-off feature to minimize current consumption when  $V_{av}$  or  $V_{bus}$  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.

### IMPORTANT NOTE:

For additional performance information, please contact [analogswitch@fairchildsemi.com](mailto:analogswitch@fairchildsemi.com).

## Ordering Information

Part Number	Top Mark	Package
FSA203BQX	203	20-Lead Depopulated very thin Quad Flat-pack No leads (DQFN) JEDEC MO-241, 2.5 x 4.5mm

## Diagrams

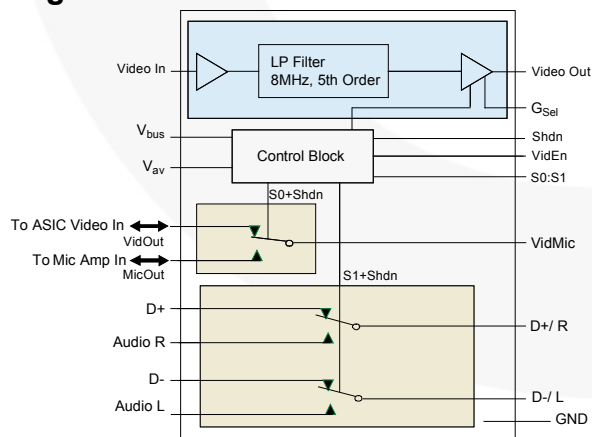


Figure 1. Functional Block Diagram

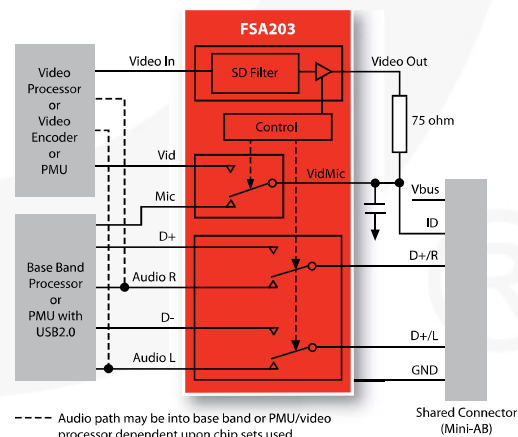


Figure 2. Typical Application Diagram

## Pin Assignments

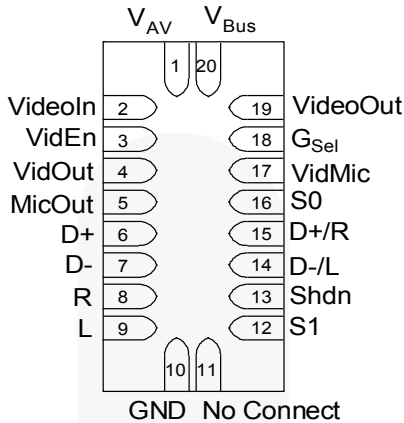


Figure 3. DQFN-20 (Top Through View)

## Pin Descriptions

Pin #	Name	Description
1	V <sub>av</sub>	Audio/Video Power Supply
2	Video In	Video Input Source
3	VidEn	Video Output Buffer Enable (Active High)
4	VidOut	Video Connection to ADC
5	MicOut	Microphone Pre-Amp Connection
6, 7	D+, D-	USB Data Bus Input sources
8, 9	R, L	Audio Right and Left Input sources
10	GND	Ground
11	NC	No Connect
12, 16	S1, S0	Switch Control Pins
13	Shdn	Shutdown Control Pin
14, 15	D-/L, D+/R	USB/Audio Common Connector Ports
17	VidMic	Video / Microphone Common Connector Port
18	G <sub>Sel</sub>	Gain Select (0dB/6dB); G <sub>Sel</sub> = High = 6dB
19	Video Out	Buffered/Filtered Video Out
20	V <sub>bus</sub>	USB V <sub>bus</sub> Supply

## Truth Table

Shdn	VidEn	S0	S1	D+/R	D-/L	Vid/Mic	Video Out
LOW	LOW	LOW	LOW	D+	D-	VidOut	Off
LOW	LOW	LOW	HIGH	R	L	VidOut	Off
LOW	LOW	HIGH	LOW	D+	D-	MicOut	Off
LOW	LOW	HIGH	HIGH	R	L	MicOut	Off
LOW	HIGH	LOW	LOW	D+	D-	VidOut	On
LOW	HIGH	LOW	HIGH	R	L	VidOut	On
LOW	HIGH	HIGH	LOW	D+	D-	MicOut	On
LOW	HIGH	HIGH	HIGH	R	L	MicOut	On
HIGH	X	X	X	Hi-Z	Hi-Z	Hi-Z	Off

## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter		Min.	Max.	Unit
$V_{AV} / V_{Bus}$	Supply Voltage		-0.5	6.0	V
$V_{SW}$	Switch I/O Voltage <sup>(1)</sup>	D+, D-, D+/R, D-/L Pins	$V_{AV} - 5.5$	$V_{AV} - 0.3$	V
		R, L, VidOut, MicOut, VidMic Pins	$V_{AV} - 5.5$	$V_{AV} - 0.3$	V
$V_{VideoIn}$	Control Input Voltage		-0.5	6.0	V
$V_{VideoOut}$	Control Output Voltage		-0.5	6.0	V
$V_{CNTRL}$	Control Input Voltage <sup>(1)</sup> S0: S1 VidEn, Shdn		-0.5	6.0	V
$I_{Video}$	Video Out Current			16	mA
$I_{IK}$	Input Clamp Diode Current		-50		mA
$I_{SW}$	Switch I/O Current (Continuous)	USB D+, D-		20	mA
		R, L, D+/R, D-/L		50	
		VidOut, MicOut, VidMic		50	
$I_{SWPEAK}$	Peak Switch Current (Pulsed at 1ms Duration, <10% Duty Cycle)	USB D+, D-		100	mA
		R, L, D+/R, D-/L		250	
		VidOut, MicOut, VidMic		250	
$T_{STG}$	Storage Temperature Range		-65	+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		5.5	kV
		All other pins		6.5	
		$V_{AV}/V_{Bus}$ to GND		12.0	
	Charged Discharge Model (JEDEC: JESD22-C101)				2.0

### Note:

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

## Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter	Min.	Max.	Unit
$V_{AV}$	Supply Voltage	3.0	3.6	V
$V_{Bus}$	Supply Voltage	4.25	5.5	V
$V_{VideoIn}$	Video Input Voltage	0	$V_{AV}$	V
$V_{VideoOut}$	Video Output Voltage	0	$V_{AV}$	V
$V_{CNTRL}$	Control Input Voltage	0	$V_{AV}$	V
$V_{SW}$	Switch I/O Voltage	$V_{AV} - 5.5$	$V_{AV} - 0.3$	
$T_A$	Operating Temperature	-40	85	°C

## DC Electrical Characteristics

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

Symbol	Parameter	Conditions	$V_{AV}/V_{Bus}$ (V)	$T_A = -40^\circ\text{C to }+85^\circ\text{C}$			Unit
				Min.	Typ.	Max.	
$V_{IK}$	Clamp Diode Voltage	$I_{IK} = -18\text{mA}$	$V_{AV} = 3.0\text{V}$ $V_{Bus} = 0\text{V}$			-1.2	V
$V_{IH}$	Control Input Voltage HIGH		$V_{AV} = 3.0$ to $3.6\text{V}$ $V_{Bus} = 5.5\text{V}$	1.3			V
$V_{IL}$	Control Input Voltage LOW		$V_{AV} = 3.0$ to $3.6\text{V}$ $V_{Bus} = 5.5\text{V}$			0.5	
$I_{IN}$	Control Input Current	$V_{CNTRL} = 0$ to $3.6\text{V}$	$V_{AV} = 3.0$ to $3.6\text{V}$ $V_{Bus} = 5.5\text{V}$	-1		1	$\mu\text{A}$
$I_{OFF}$	Power Off Leakage Current (Common Port Only D+/R, D-/L, VidMic)	Common Ports (D+/R, D-/L); $V_{SW} = 0$ to $5.5\text{V}$ See Figure 15	$V_{AV} = 0\text{V}$ $V_{Bus} = 0\text{V}$			500	nA
$I_{OZ(OFF)}$	Off Leakage Current of Ports D+, D-, R, L, MicOut, VidOut)	Ports (D+/R, D-/L = $0.3\text{V}$ , $V_{AV} - 0.3\text{V}$ , D+, D-, R, L = $0.3\text{V}$ , $V_{AV} - 0.3\text{V}$ or Floating) See Figure 15	$V_{AV} = 0\text{V}$ $V_{Bus} = 0\text{V}$			500	nA
$I_{NC(ON)}$	On-Leakage Current of Ports D+/R, D-/L or VidMic	Ports (D+/R, D-/L = $0.3\text{V}$ , $V_{AV} - 0.3\text{V}$ , D+, D-, R, L = $0.3\text{V}$ , $V_{AV} - 0.3\text{V}$ or Floating) See Figure 16	$V_{AV} = 3.6\text{V}$ $V_{Bus} = 5.5\text{V}$	-100	50	100	nA
<b>USB Switch Path</b>							
	USB Analog Signal Range <sup>(3)</sup>			0		3.6	V
$R_{ONUSB}$	Switch On Resistance <sup>(2)</sup>	$V_{D+/D-} = 0\text{V}, 0.4\text{V}$ , $I_{ON} = -8\text{mA}$ See Figure 5, Figure 14	$V_{AV} = 3.0\text{V}$ $V_{Bus} = 4.25\text{V}$		4	6	$\Omega$
$\Delta R_{ONUSB}$	Delta On Resistance <sup>(3)</sup>	$V_{D+/D-} = 0\text{V}, 0.4\text{V}$ , $I_{ON} = -8\text{mA}$	$V_{AV} = 3.0\text{V}$ $V_{Bus} = 4.25\text{V}$		0.35		$\Omega$
$R_{FLAT(ON)USB}$	$R_{ON}$ Flatness <sup>(4)</sup>	$V_{D+/D-} = 0\text{V}, 0.4\text{V}$ , $I_{ON} = -8\text{mA}$	$V_{AV} = 3.0\text{V}$ $V_{Bus} = 4.25\text{V}$	1.0		2.5	$\Omega$
<b>Audio R/L Switch Path</b>							
	Audio Analog Signal Range <sup>(3)</sup>			$V_{AV} - 5.5$		$V_{AV}$	V
$R_{ONAudio}$	Switch On Resistance <sup>(2)</sup>	$V_{L/R} = 0\text{V}, 0.7\text{V}$ ; $V_{AV} = 0.7\text{V}$ , $V_{AV}$ ; $I_{ON} = -20\text{mA}$ ; $V_{Bus} = 0\text{V}$ See Figure 4, Figure 14	$V_{AV} = 3.0\text{V}$ $V_{Bus} = 0\text{V}$		3.5	5.5	$\Omega$
$\Delta R_{ONAudio}$	Delta On Resistance <sup>(3)</sup>	$V_{L/R} = 0\text{V}, 0.7\text{V}$ ; $I_{ON} = -20\text{mA}$	$V_{AV} = 3.0\text{V}$ $V_{Bus} = 0\text{V}$	0.10		0.35	$\Omega$
$R_{FLAT(ON)Audio}$	$R_{ON}$ Flatness <sup>(4)</sup>	$V_{L/R} = 0\text{V}, 0.7\text{V}$ ; $I_{ON} = -20\text{mA}$	$V_{AV} = 3.0\text{V}$ $V_{Bus} = 0\text{V}$		0.5	2.5	$\Omega$

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## DC Electrical Characteristics (Continued)

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

Symbol	Parameter	Conditions	V <sub>AV</sub> /V <sub>Bus</sub> (V)	T <sub>A</sub> = - 40°C to +85°C			Unit
				Min.	Typ.	Max.	
<b>VidMic Switch Path</b>							
	Audio Analog Signal Range <sup>(3)</sup>			V <sub>AV</sub> - 5.5		V <sub>AV</sub>	V
R <sub>ONVidMic</sub>	Video Switch On Resistance <sup>(2)</sup>	V <sub>Vid/Mic</sub> = 0V, 0.7V; I <sub>ON</sub> = -13mA See Figure 6, Figure 14	V <sub>AV</sub> = 3.0V V <sub>Bus</sub> = 0V		3	6	Ω
<b>Video Buffer Path</b>							
V <sub>INV</sub>	Video Input Voltage Range		V <sub>AV</sub> = 3.0V V <sub>Bus</sub> = 0V		1.2V <sub>pp</sub>		V <sub>pp</sub>
V <sub>OLS</sub>	Output Level Shift	V <sub>VidIoIn</sub> = 0V; R <sub>S</sub> = 37.5Ω AC Coupled into 150Ω	V <sub>AV</sub> = 3.0V V <sub>Bus</sub> = 0V		250		mV
R <sub>OUTVID</sub>	Video Output Impedance <sup>(3)</sup>		V <sub>AV</sub> = 3.6V V <sub>Bus</sub> = 0V		2.5		kΩ
<b>Power Supply</b>							
I <sub>CC(AV)</sub>	Quiescent Supply Current	V <sub>CNTRL</sub> = 0V to V <sub>AV</sub> I <sub>OUT</sub> = 0	V <sub>AV</sub> = 3.6V V <sub>Bus</sub> = 0V		4.5	6.4	mA
I <sub>CC(VBus)</sub>	Quiescent Supply Current	V <sub>CNTRL</sub> = 0V to V <sub>AV</sub> I <sub>OUT</sub> = 0	V <sub>AV</sub> = 3.0V V <sub>Bus</sub> = 5.5V			20	μA
I <sub>SHDN</sub>	Shutdown Current		V <sub>AV</sub> = 3.6V V <sub>Bus</sub> = 0V		.050	0.100	μA
I <sub>CCT</sub>	Increase in I <sub>CC</sub> per Control Voltage and V <sub>AV</sub>	V <sub>CNTRL</sub> = 1.8V	V <sub>AV</sub> = 3.6V V <sub>Bus</sub> = 0V			18	μA
		V <sub>CNTRL</sub> = 2.6V	V <sub>AV</sub> = 3.6V V <sub>Bus</sub> = 0V			15	μA

### Notes:

- R<sub>ON</sub> measured by the voltage drop between 1Bn (2Bn) and 1A (2A) pins at identical current through the switch. R<sub>ON</sub> is determined by the lower of the voltage on the two pins.
- Guaranteed by characterization, not production tested.
- 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  $V_{AV} = 3.3V$ ,  $V_{BUS} = 5.0V$ , and at  $25^{\circ}C$  unless otherwise specified.

Symbol	Parameter	Conditions	$V_{AV}/V_{BUS}$ (V)	$T_A = -40^{\circ}C$ to $+85^{\circ}C$			Unit
				Min.	Typ.	Max.	
$t_{ONAudio}$	Turn-On Time S1 or Shdn to Output	$V_{D+/R, D-/L} = 0.8V$ $R_L = 50\Omega$ , $C_L = 5pF$ See Figure 17, Figure 18	$V_{AV} = 3.0V$ $V_{BUS} = 0V$		25	45	ns
$t_{OFFAudio}$	Turn-Off Time S1 or Shdn to Output	$V_{D+/R, D-/L} = 0.8V$ $R_L = 50\Omega$ , $C_L = 5pF$ See Figure 17, Figure 18	$V_{AV} = 3.0V$ $V_{BUS} = 0V$		22	30	ns
$t_{ONUSB}$	Turn-On Time S1 or Shdn to Output	$V_{D+/R, D-/L} = 0.8V$ $R_L = 50\Omega$ , $C_L = 5pF$ See Figure 17, Figure 18	$V_{AV} = 3.0V$ $V_{BUS} = 4.25V$		31	40	ns
$t_{OFFUSB}$	Turn-Off Time S1 or Shdn to Output	$V_{D+/R, D-/L} = 0.8V$ $R_L = 50\Omega$ , $C_L = 5pF$ See Figure 17, Figure 18	$V_{AV} = 3.0V$ $V_{BUS} = 4.25V$		12	25	ns
$t_{PDUSB}$	USB Switch Propagation Delay <sup>(5)</sup>	$R_L = 50\Omega$ , $C_L = 5pF$ See Figure 19	$V_{AV} = 3.0V$ $V_{BUS} = 4.25V$		0.25		ns
$O_{IRRUSB}$	Off-Isolation – USB	$f = 1MHz$ , $R_T = 50\Omega$ , $C_L = 5pF$ See Figure 7, Figure 21	$V_{AV} = 3.0V$ $V_{BUS} = 4.25V$		-80		dB
$O_{IRRA}$	Off-Isolation – Audio	$f = 20kHz$ , $R_T = 50\Omega$ , $C_L = 5pF$ See Figure 8, Figure 21	$V_{AV} = 3.0V$ $V_{BUS} = 4.25V$		-100		dB
$Xtalk_{USB}$	Non-Adjacent Channel Crosstalk – USB	$f = 1MHz$ , $R_L = 50\Omega$ See Figure 9, Figure 22	$V_{AV} = 3.0V$ $V_{BUS} = 4.25V$		-80		dB
$Xtalk_A$	Non-Adjacent Channel Crosstalk – Audio	$f = 20kHz$ , $R_L = 50\Omega$ See Figure 10, Figure 22	$V_{AV} = 3.0V$ $V_{BUS} = 4.25V$		-80		dB
$BW_{USB}$	-3db Bandwidth - USB	$R_T = 50\Omega$ , $C_L = 0pF$ , Signal 0dBm See Figure 11, Figure 20	$V_{AV} = 3.0V$ $V_{BUS} = 4.25V$		780		MHz
		$R_T = 50\Omega$ , $C_L = 5pF$ , Signal 0dBm See Figure 11, Figure 20	$V_{AV} = 3.0V$ $V_{BUS} = 4.25V$		450		MHz
THD	Total Harmonic Distortion	$R_L = 32\Omega$	$V_{AV} = 3.0V$ $V_{BUS} = 0V$		0.01		%
$PSRR_{Audio}$	Power Supply Rejection Ratio	$V_{R,L} = 0.8V$ ; $R_T = 32\Omega$ ; $f=217Hz$ on $V_{AV}$ at $600mV_{pp}$ See Figure 25	$V_{AV} = 3.0V$ $V_{BUS} = 0V$		40		dB

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### AC Electrical Characteristics (Continued)

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

Symbol	Parameter	Conditions	$V_{AV}/V_{BUS}$ (V)	$T_A = -40^{\circ}C$ to $+85^{\circ}C$			Unit
				Min.	Typ.	Max.	
<b>VidMic Switch</b>							
$t_{ON}$	Turn-On Time S1 or Shdn to Output	$V_{VidMic} = 0.8V$ $R_L = 75\Omega$ , $C_L = 5pF$ See Figure 17, Figure 18	$V_{AV} = 3.0V$ $V_{BUS} = 0V$		35	50	ns
$t_{OFF}$	Turn-Off Time S1 or Shdn to Output	$V_{VidMic} = 0.8V$ $R_L = 75\Omega$ , $C_L = 5pF$ See Figure 17, Figure 18	$V_{AV} = 3.0V$ $V_{BUS} = 0V$		15	35	ns
$BW_{VidMic}$	-3db Bandwidth	$R_T = 50\Omega$ , $C_L = 0pF$ , Signal 0dBm See Figure 12, Figure 20	$V_{AV} = 3.0V$ $V_{BUS} = 0V$		615		MHz
		$R_T = 50\Omega$ , $C_L = 5pF$ , Signal 0dBm See Figure 12, Figure 20	$V_{AV} = 3.0V$ $V_{BUS} = 0V$		400		MHz
$Xtalk_{VidMic}$	Non-Adjacent Channel Crosstalk – VidMic	$f = 30MHz$ , $R_L = 50\Omega$ See Figure 22	$V_{AV} = 3.0V$ $V_{BUS} = 0V$		-35		dB
<b>Video Buffer Path</b>							
$t_{VidEn}$	Turn-On Time VidEn or Shdn to VideoOut	$V_{Videoln} = 0.5V$ $R_S = 37.5\Omega$	$V_{AV} = 3.0V$ $V_{BUS} = 0V$		325		$\mu s$
$t_{VidDis}$	Turn-Off Time VidEn or Shdn to VideoOut	$V_{Videoln} = 0.5V$ $R_S = 37.5\Omega$	$V_{AV} = 3.0V$ $V_{BUS} = 0V$		20		ns
$A_{V6dB}$	Voltage Gain	$R_S = 37.5\Omega$ ; AC Coupled into $150\Omega$	$V_{AV} = 3.0$ to $4.3V$		6		dB
$BW_{1dB}$	-1db Bandwidth	See Figure 13, Figure 26	$V_{AV} = 3.0V$ $V_{BUS} = 5.0V$		8		MHz
$BW_{3dB}$	-3db Bandwidth	See Figure 13, Figure 26	$V_{AV} = 3.0V$ $V_{BUS} = 5.0V$		9		MHz
$F_{SB}$	Attenuation	$R_S = 37.5\Omega$ ; AC Coupled into $150\Omega$ ; $f=27MHz$ Referenced to 100kHz, $V_{ideoln} = 0dBm$	$V_{AV} = 3.0V$ $V_{BUS} = 5.0V$		-42		dB
$PSRR_{Video}$	Power Supply Rejection Ratio	See Figure 25	$V_{AV} = 3.3V$ $V_{BUS} = 0V$		-40		dB
$OIRR_{VidOut}$	Off-Isolation – Video Out	See Figure 27	$V_{AV} = 3.0V$ $V_{BUS} = 4.25V$		-50		dB
dG	Differential Gain	$R_S = 37.5\Omega$ ; AC Coupled into $150\Omega$ See Figure 28	$V_{AV} = 3.0V$ $V_{BUS} = 0V$		.5		%
d $\phi$	Differential Phase	$R_S = 37.5\Omega$ ; AC Coupled into $150\Omega$ See Figure 28	$V_{AV} = 3.0V$ $V_{BUS} = 0V$		.9		$^{\circ}$
SNR	Signal-to-Noise Ratio	NTSC-7 Weighting, $f=100kHz$ to $4.2MHz$ See Figure 28	$V_{AV} = 3.0V$ $V_{BUS} = 0V$		75		dB

## USB High-Speed-Related AC Electrical Characteristics

All typical value are for  $V_{AV} = 3.0V$ ,  $V_{BUS} = 4.25V$ , and at  $25^{\circ}C$  unless otherwise specified.

Symbol	Parameter	Conditions	$V_{AV}/V_{BUS}$ (V)	$T_A = -40^{\circ}C$ to $+85^{\circ}C$			Unit
				Min.	Typ.	Max.	
$t_{SK(O)}$	Channel-to-Channel Skew <sup>(5)</sup>	$t_R = t_F = 75ps$ (10-90%) at 240MHz; $C_L = 5pF$ , $R_L = 50\Omega$	$V_{AV} = 3.0V$ $V_{BUS} = 4.25V$		50		ps
$t_{SK(P)}$	Skew of Opposite Transitions of the Same Output <sup>(5)</sup>	$t_R = t_F = 75ps$ (10-90%) at 240MHz; $C_L = 5pF$ , $R_L = 50\Omega$	$V_{AV} = 3.0V$ $V_{BUS} = 4.25V$		50		ps
$t_J$	Total Jitter <sup>(5)</sup>	$t_R = t_F = 75ps$ (10-90%) at 480Mbps; $C_L = 5pF$ , $R_L = 50\Omega$ ; (PRBS = $2^{15} - 1$ )	$V_{AV} = 3.0V$ $V_{BUS} = 4.25V$		100		ps

**Note:**

- Guaranteed by characterization, not production tested.

## Capacitance

Symbol	Parameter	Conditions	$V_{AV}/V_{BUS}$ (V)	$T_A = -40^{\circ}C$ to $+85^{\circ}C$	Unit
				Typical	
$C_{IN(CNTRL)}$	Control Pin Input Capacitance (S0, S1, /Shdn, VidEn)	$V_{BIAS} = 0V$	$V_{AV} = 3.0V$ $V_{BUS} = 4.25V$	2.75	pF
$C_{ON(D+R, D-L)}$	$C_{D+R, D-L}$ Source Port On Capacitance	$V_{BIAS} = 0.4V$ ; $f = 1MHz$ , 240Mhz See Figure 24	$V_{AV} = 3.0V$ $V_{BUS} = 4.25V$ $S1 = 0V$ $C_{ONUSB}$	7.6	pF
		$V_{BIAS} = 0V$ ; $f = 1MHz$ , 240Mhz See Figure 24	$V_{AV} = 3.0V$ $V_{BUS} = 4.25V$ $S1 = 3.0V$ $C_{ONAudio}$	9.7	
$C_{OFF(D+, D-)}$	USB Source Off Capacitance	$V_{BIAS} = 0.4V$ ; $f = 1MHz$ , 240Mhz See Figure 23	$V_{AV} = 3.0V$ $V_{BUS} = 4.25V$ $S1 = 3.0V_o$	1.5	pF
$C_{OFF(R/L)}$	Audio Source Off Capacitance	$V_{BIAS} = 0V$ ; $f = 1MHz$ See Figure 23	$V_{AV} = 3.0V$ $V_{BUS} = 4.25V$ $S1 = 0V$	3.0	pF
$C_{ON(VidMic)}$	VidMic Source On Capacitance	$V_{BIAS} = 0V$ ; $f = 1MHz$ See Figure 24	$V_{AV} = 3.0V$ $V_{BUS} = 4.25V$	10 (15 Max.)	pF
$C_{OFF(MicOut)}$	MicOut Source Off Capacitance	$V_{BIAS} = 0V$ ; $f = 1MHz$ See Figure 23	$V_{AV} = 3.0V$ $V_{BUS} = 4.25V$	3.0	pF
$C_{OFF(VidOut)}$	VidOut Source Off Capacitance	$V_{BIAS} = 0V$ ; $f = 1MHz$ See Figure 23	$V_{AV} = 3.0V$ $V_{BUS} = 4.25V$	2.7	pF



Typical Characteristics

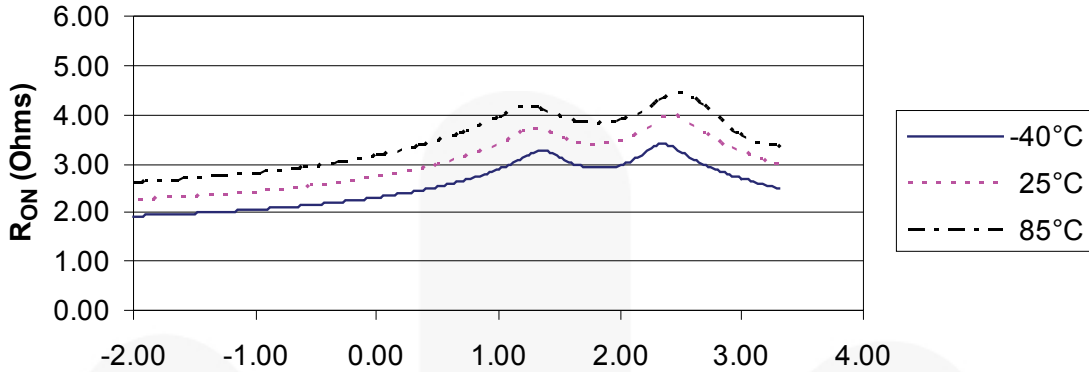


Figure 4.  $R_{ONAudio}$ ,  $V_{IN}$ ,  $V_{AV} = 3.0V$ ,  $V_{Bus} = 0V$

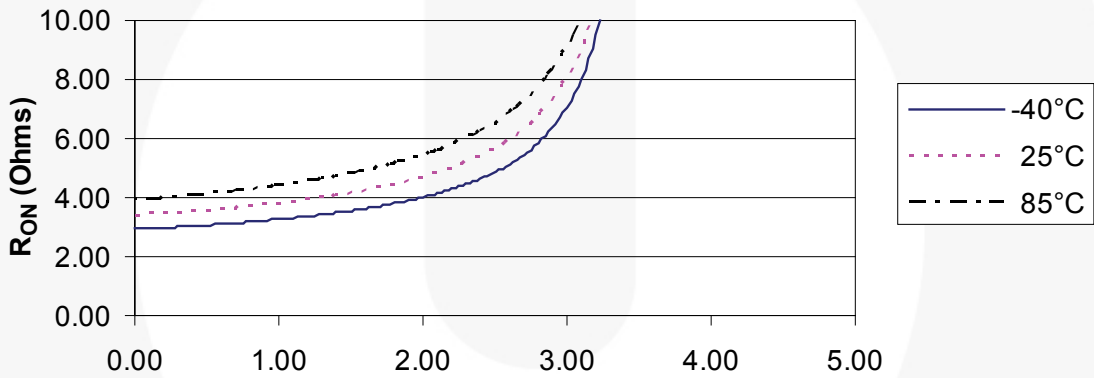


Figure 5.  $R_{ONUSB}$ ,  $V_{IN}$ ,  $V_{AV} = 3.0V$ ,  $V_{Bus} = 4.25V$

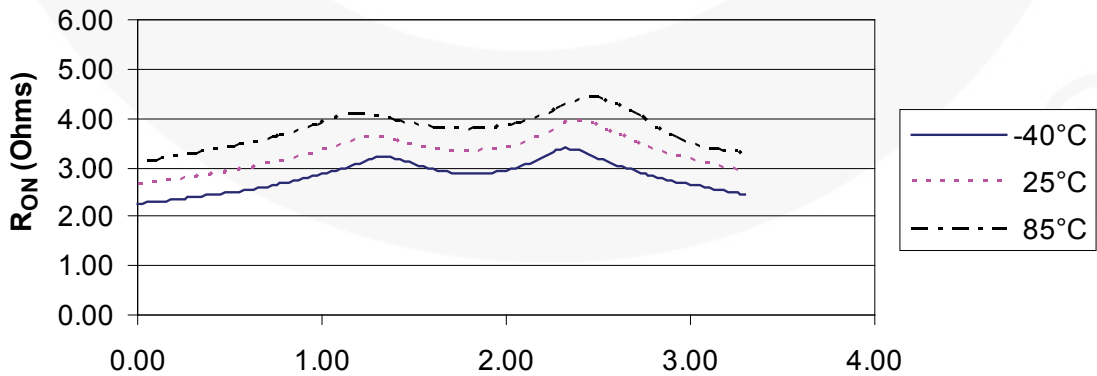


Figure 6.  $R_{ONVid}$ ,  $V_{IN}$ ,  $V_{AV} = 3.0V$ ,  $V_{Bus} = 0V$

Typical Characteristics (Continued)

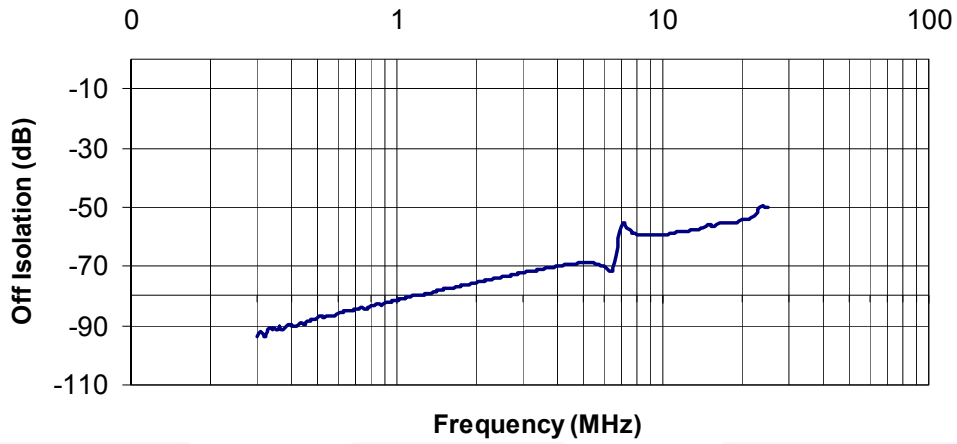


Figure 7. Off Isolation USB (OIRRUSB),  $V_{AV} = 3.0V$ ,  $V_{BUS} = 4.25V$

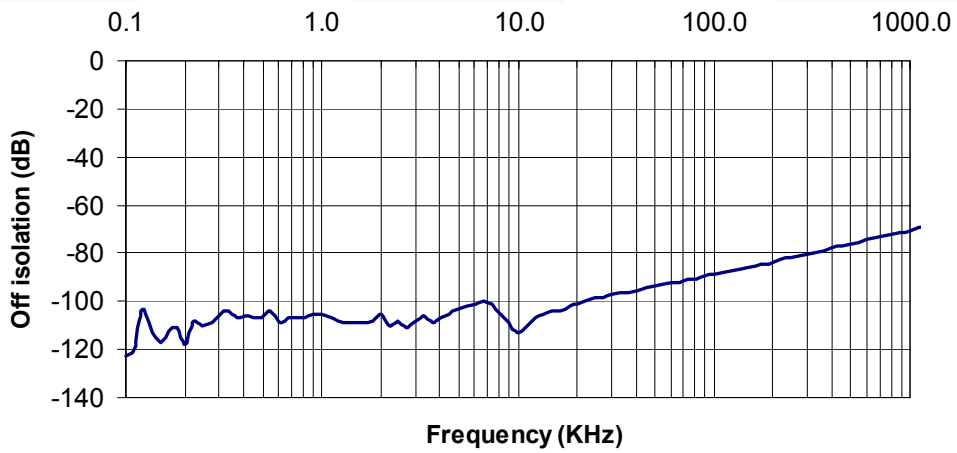


Figure 8. Off Isolation Audio (OIRRA),  $V_{AV} = 3.0V$ ,  $V_{BUS} = 4.25V$

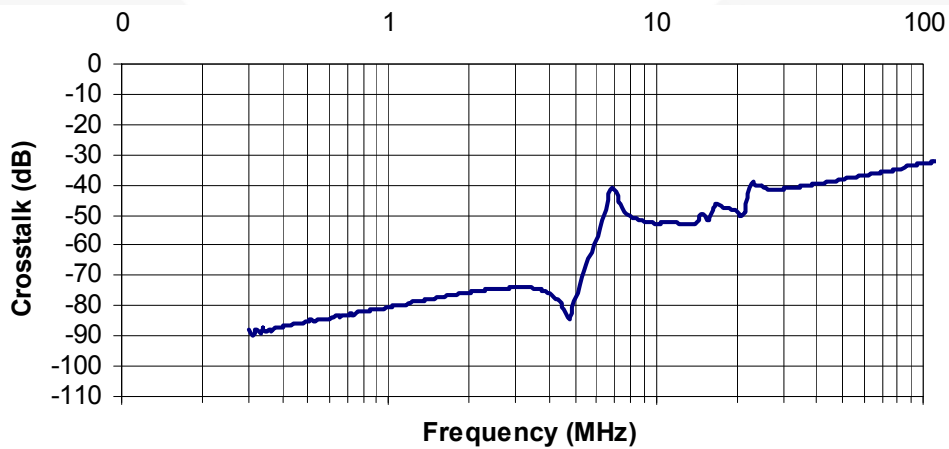


Figure 9. Non-Adjacent Crosstalk - USB,  $V_{AV} = 3.0V$ ,  $V_{BUS} = 4.25V$

Typical Characteristics (Continued)

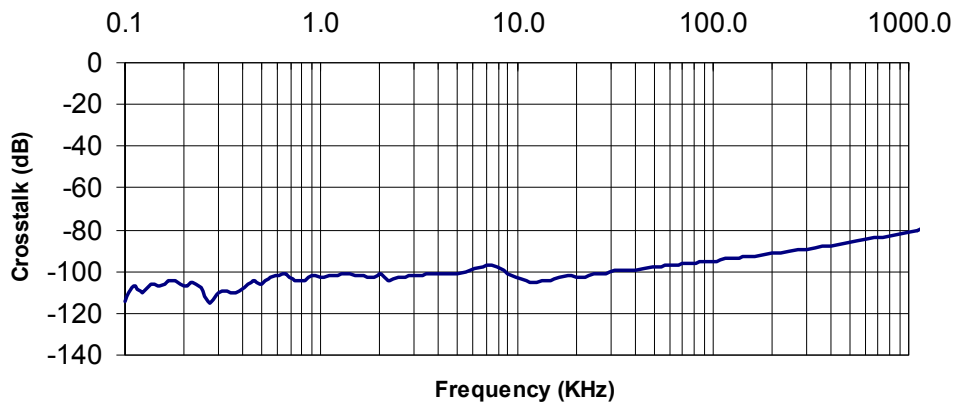


Figure 10. Non-Adjacent Crosstalk - Audio,  $V_{AV} = 3.0V$ ,  $V_{BUS} = 4.25V$

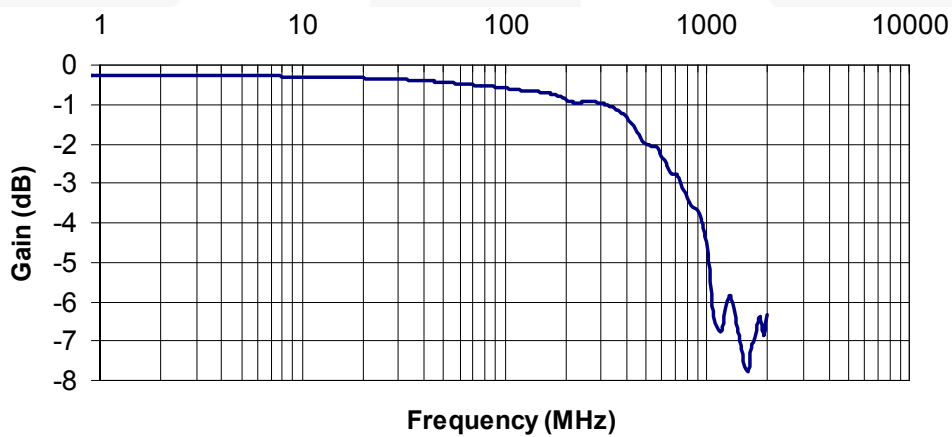


Figure 11. Bandwidth Gain vs. Frequency - USB,  $C_L = 0pF$ ,  $V_{AV} = 3.0V$ ,  $V_{BUS} = 4.25V$

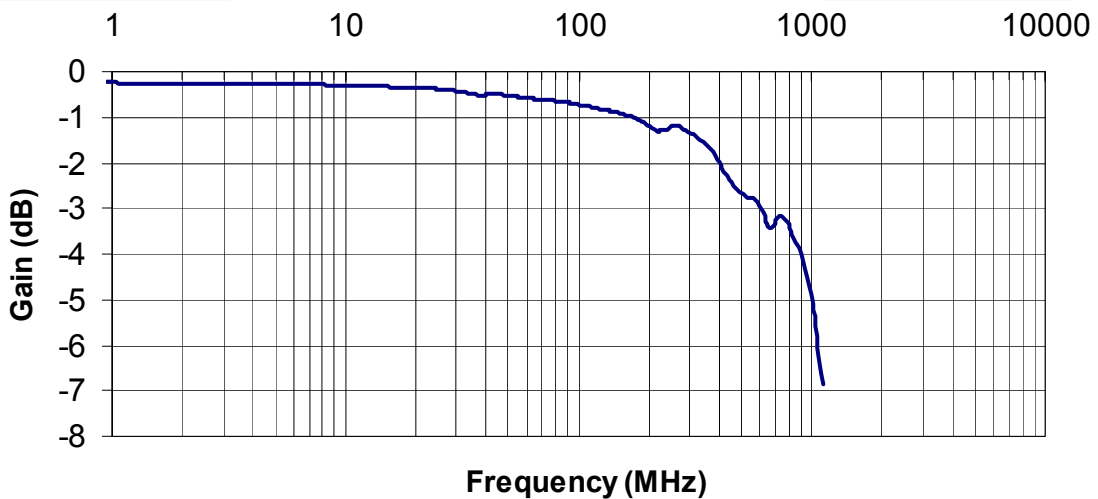


Figure 12. Bandwidth Gain vs. Frequency – VidMic,  $C_L = 0pF$ ,  $V_{AV} = 3.0V$ ,  $V_{BUS} = 0V$

Typical Characteristics (Continued)

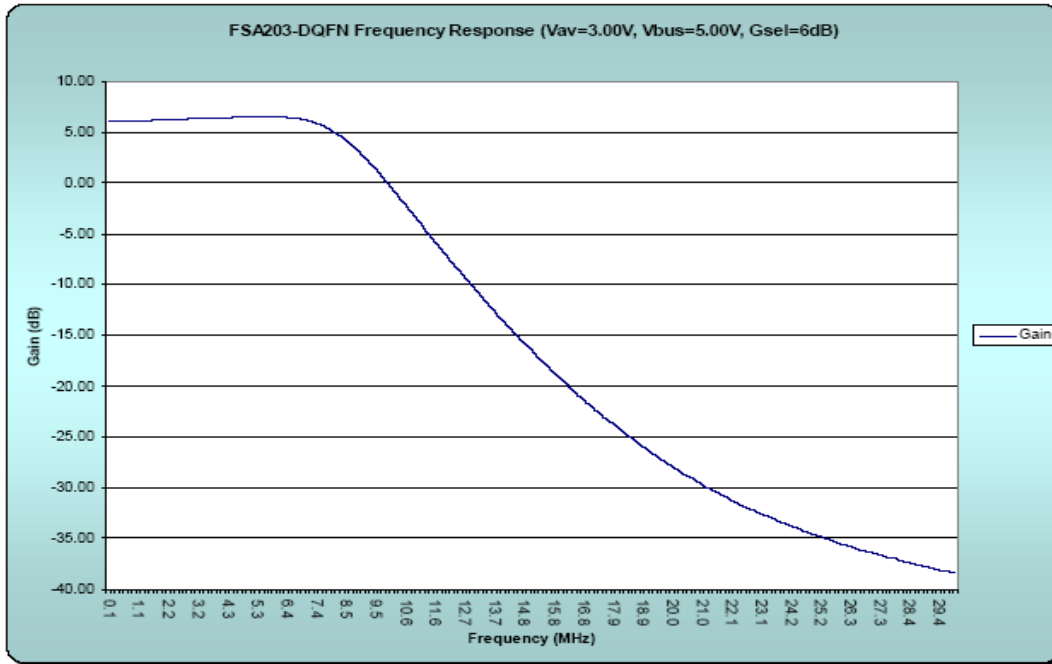
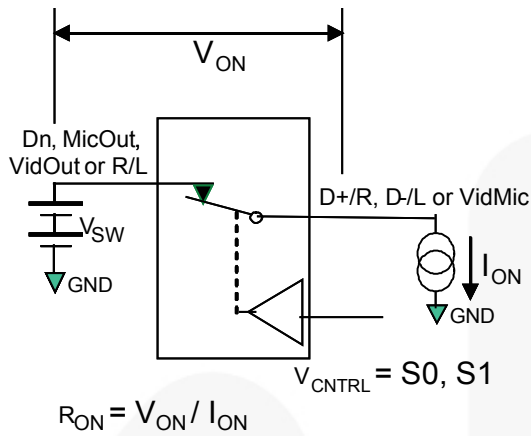
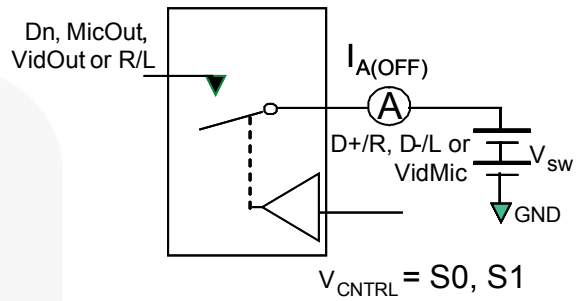


Figure 13. Video Buffer Frequency Response

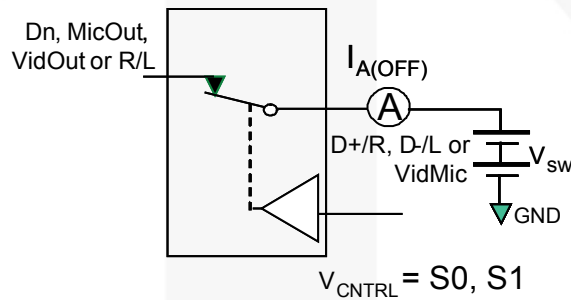
### Test Diagrams



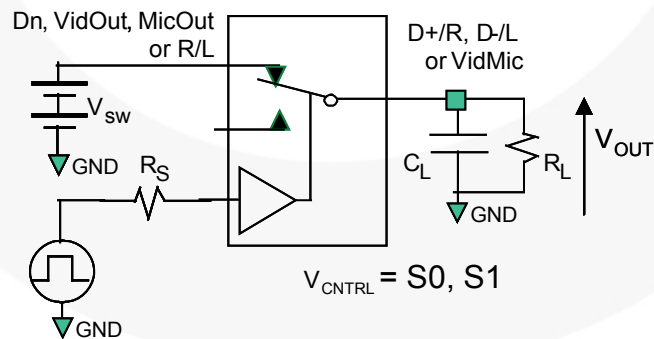
**Figure 14. On Resistance**



**Figure 15. Off Leakage**



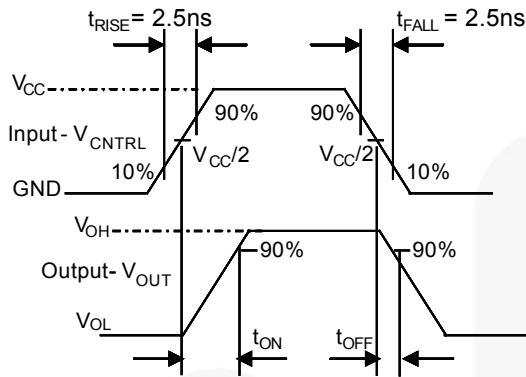
**Figure 16. On Leakage**



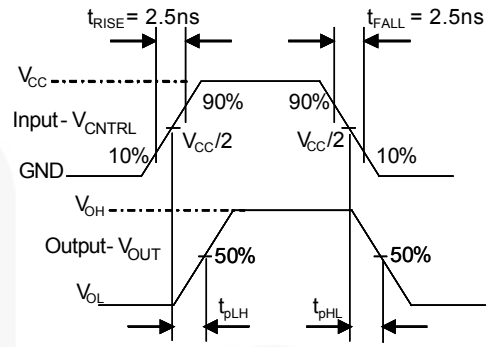
$R_L$ ,  $R_S$ , and  $C_L$  are functions of the application environment (see AC Tables for specific values)  
 $C_L$  includes test fixture and stray capacitance

**Figure 17. AC Test Circuit Load**

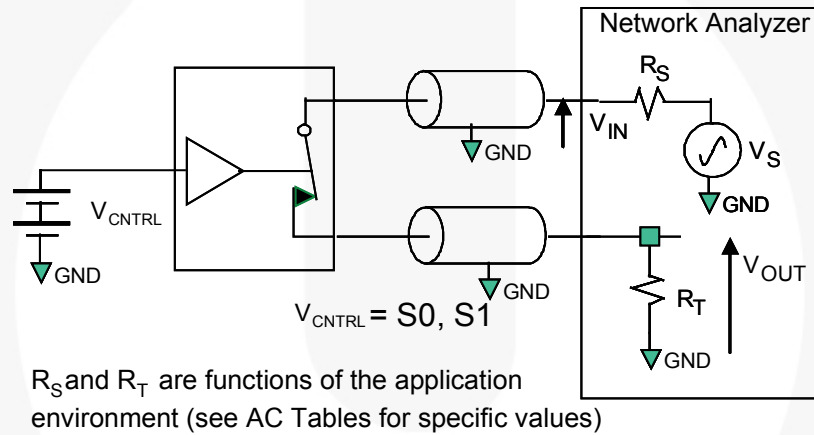
**Test Diagrams** (Continued)



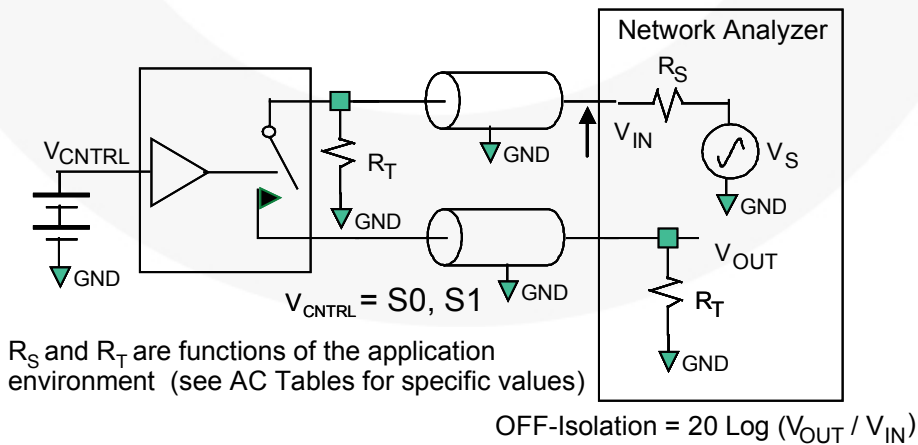
**Figure 18. Turn-On / Turn-Off Waveforms**



**Figure 19. Switch Propagation Delay Waveforms**

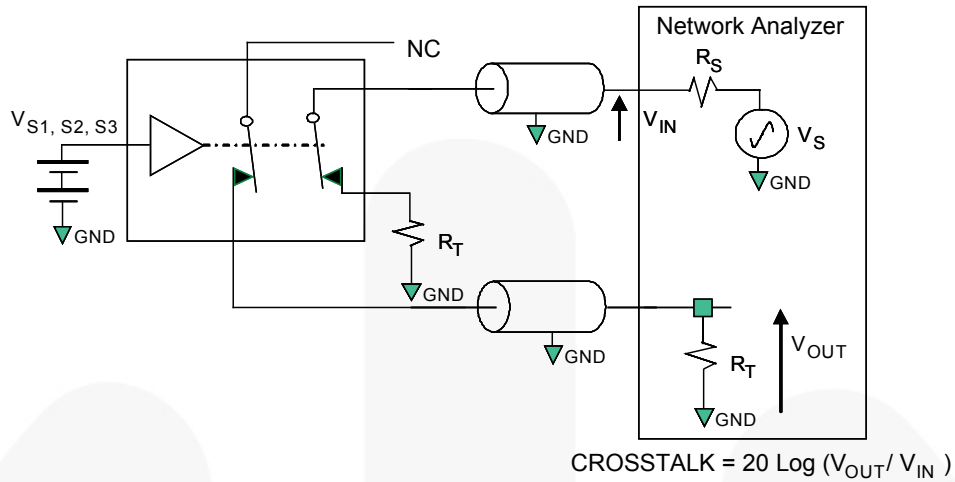


**Figure 20. Switch Bandwidth**

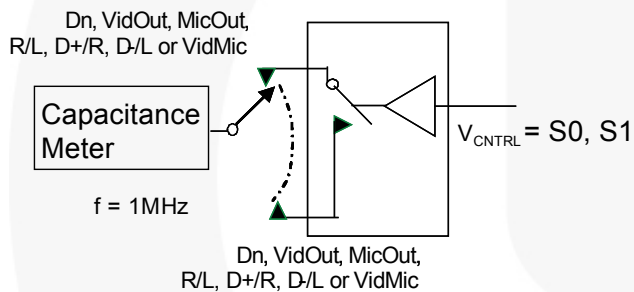


**Figure 21. Channel Off Isolation**

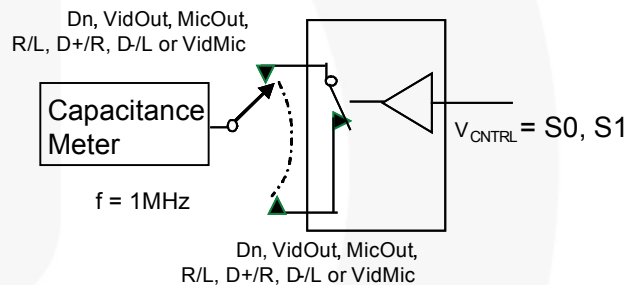
**Test Diagrams** (Continued)



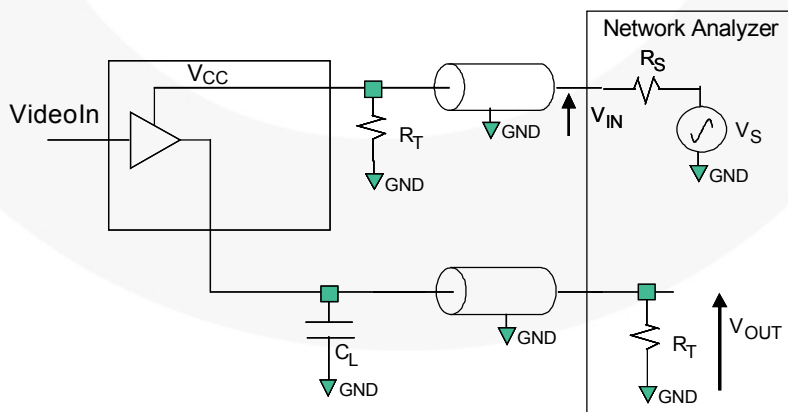
**Figure 22. Non-Adjacent Channel-to-Channel Crosstalk**



**Figure 23. Channel Off Capacitance**

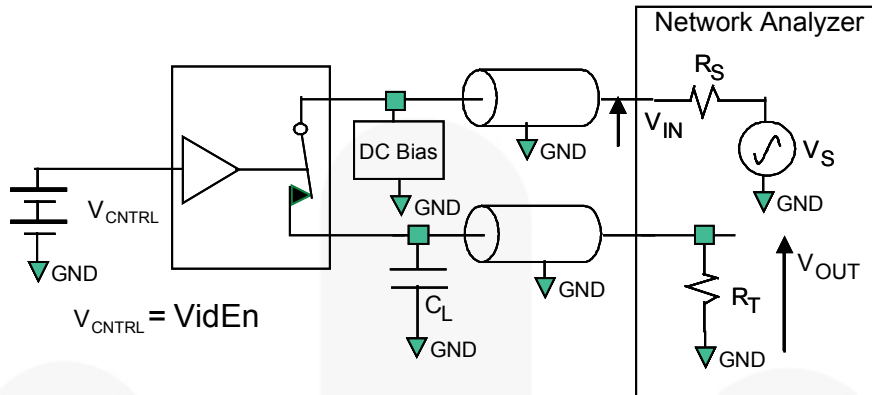


**Figure 24. Channel On Capacitance**



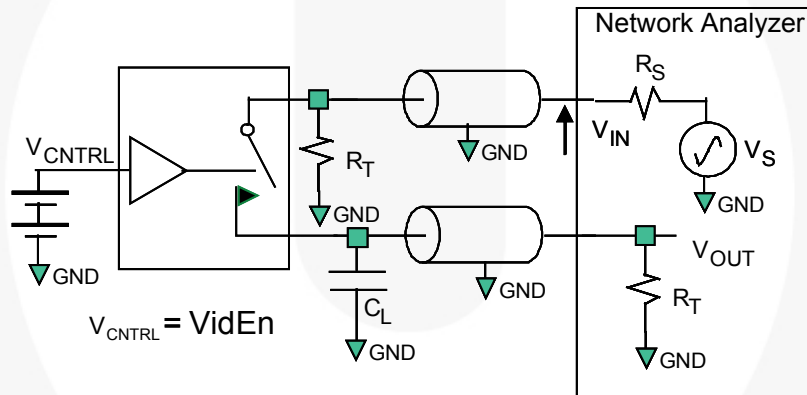
**Figure 25. PSRR**

**Test Diagrams** (Continued)



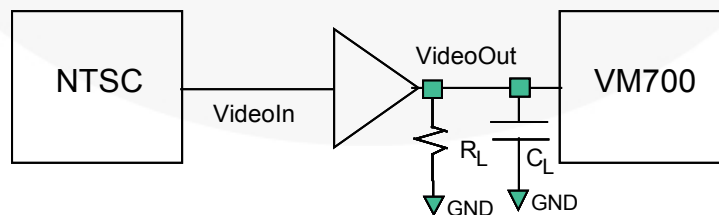
$R_S$  and  $R_T$  are functions of the application environment (see AC Tables for specific values)

**Figure 26. Video Amplifier Bandwidth**



$$\text{OFF-Isolation} = 20 \text{ Log } (V_{OUT} / V_{IN})$$

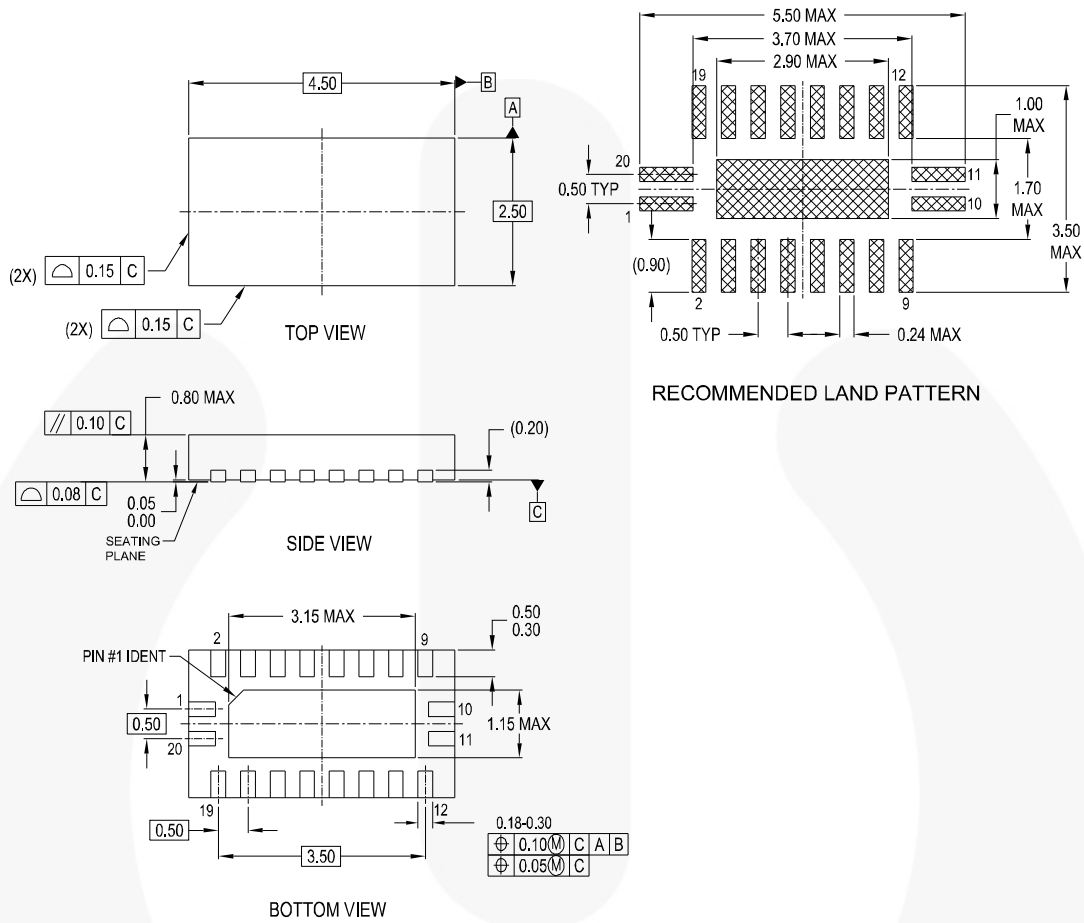
**Figure 27. Video Amplifier Off Isolation**



**Figure 28. Video Amplifier Differential Phase, Gain & SNR**



## Physical Dimensions



### NOTES:

- A. CONFORMS TO JEDEC REGISTRATION MO-241, VARIATION AC
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994

MLP020BrevA

**Figure 29. 20-Lead Depopulated very thin Quad Flat-pack No leads (DQFN)**

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Rev. I54