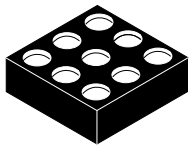
Dual SPST Depletion Audio Switch with Negative Swing

FSA553



WLCSP9 1.385x1.215x0.581
CASE 567SV

Description

The FSA553 is a high−performance dual single−pole single−throw (SPST x 2) audio switch. The Depletion technology allows the device to conduct signals when there is no VCC available and to isolate signals when VCC is present. During signal conduction, the Depletion gate control allows the FSA553 to achieve excellent THD+N performance while consuming minimal power.

Features

- Dual SPST Depletion Switch
- Normally Closed when VCC < 0.2 V
- Switches Configurable through Select Pins
- V_{SW}: −1.5 V to +1.5 V
- R_{ON}: 0.4 Ω (Typical)
- R_{FLAT} < 0.01 Ω (Typical)
- THD+N: −104 dB (Typical)
- OIRR: −78 dB (Typical)
- This Device is Pb−Free and Halide Free

Table of Contents

Applications

- Smart Phones
- Tablets, Ultra Books

MARKING DIAGRAM

NG = Specific Device Code
&K = 2−Digits Lot Run Traceability Code
&. = Pin One Dot
&2 = 2−Digit Date Code
&Z = Assembly Plant Code

*Date Code orientation and/or position may vary depending upon manufacturing location.

ORDERING INFORMATION

Device	Package	Shipping†
FSA553UCX	WLCSP9 (Pb−Free)	3000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

Block Diagram

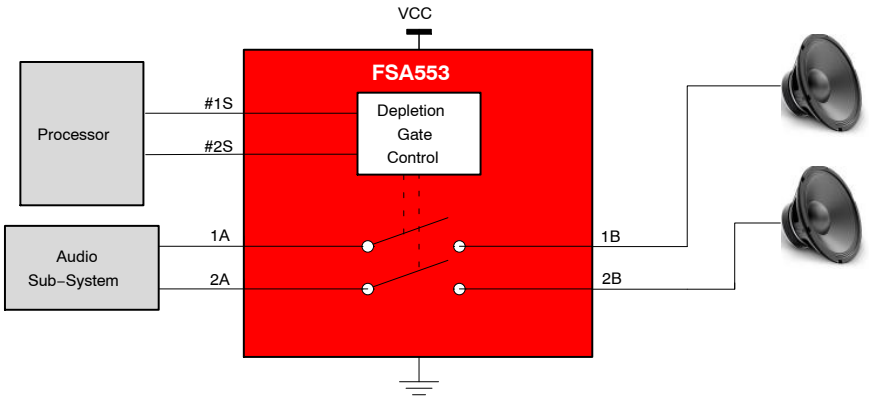


Figure 1. Application Block Diagram

Pin Configuration

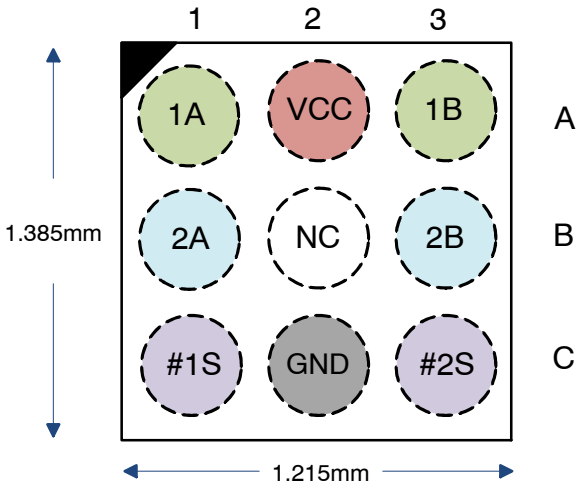


Figure 2. Top Through View

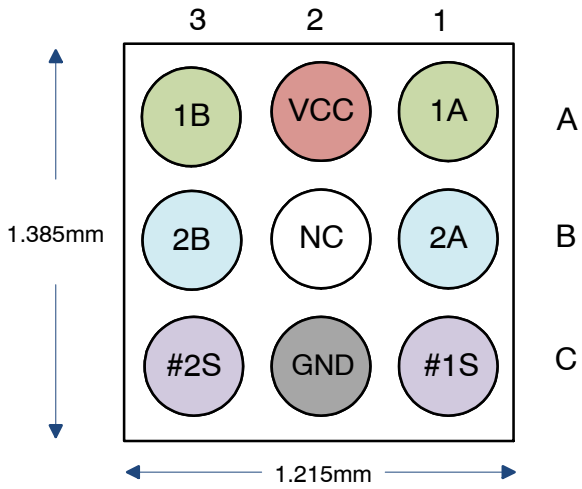


Figure 3. Bottom View

PIN DESCRIPTION

Pin #	Name	Type	Description
A1	1A	Depletion I/O	A−Port of Switch 1 (Normally Closed)
A3	1B	Depletion I/O	B−Port of Switch 1 (Normally Closed)
C1	#1S	Control	Select to Enable/Disable SW1 (Enable LOW)
A2	V_{CC}	Power Supply / Control	Power Supply Input
B2	NC	No Connect	Do Not Connect
C2	GND	Ground	Ground
B1	2A	Depletion I/O	A−Port of Switch 2 (Normally Closed)
B3	2B	Depletion I/O	B−Port of Switch 2 (Normally Closed)
C3	#2S	Control	Select to Enable/Disable SW2 (Enable LOW)

SWITCH TRUTH TABLE

V_{CC}	#1S	#2S	Switch 1	Switch 2
LOW	X	X	ON	ON
HIGH	HIGH	HIGH	OFF	OFF
HIGH	LOW	HIGH	ON	OFF
HIGH	HIGH	LOW	OFF	ON

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter		Min	Max	Unit
V_{CC}	Supply/Control Voltage		−0.5	4.3	V
V_{CNTRL}	Select Input Voltage	#1S, #2S	−0.5	4.3	V
$V_{SW(ON)}$	DC Switch C Voltage (Switch Conducting)	1A, 1B, 2A, 2B	−2.0	2.0	V
$V_{SW(OFF)}$	DC Switch I/O Voltage (Switch Isolated)	1A, 1B, 2A, 2B	−2.0	2.0	V
I_{SW}	Switch I/O Current	V_{CC} = 0 V (Switch Conducting)		350	mA
I_{SWPEAK}	Peak Switch Current	Pulsed at 1 ms Duration, <10% Duty Cycle		500	mA
ESD	Human Body Model, ANSI/ESDA/JEDEC JS−001−2012	I/O Ports		7	kV
		All Other Pins		4	
	Charged Device Model, JEDEC: JESD22−C101			2	
	IEC 61000−4−2 System	Contact		8	
		Air Gap		15	
T_A	Absolute Maximum Operating Temperature		−40	+85	°C
θ_{JA}	Thermal Resistance, Junction−to−Ambient	2S2P JEDEC std. PCB		97	°C/W
T_{STG}	Storage Temperature		−65	+150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Max	Unit
$V_{CC(ON)}$	Supply Voltage with Depletion Switch Conducting (1A = 1B; 2A = 2B)		0	0.2	V
$V_{CC(OFF)}$	Supply Voltage with Depletion Switch Isolated (1A≠1B; 2A≠2B; #1S = #2S = HIGH)		1.5	3.0	V
$V_{SW(ON)}$	DC Switch I/O Input Voltage	Switch Conducting	−1.5	1.5	V
$V_{SW(OFF)}$	DC Switch I/O Input Voltage	Switch Isolated	−1.5	1.5	V
V_{CNTRL}	Select Input Voltage	#1S, #2S	0	3.0	V

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

DC ELECTRICAL CHARACTERISTICS (Typical values are for T_A = 25°C unless otherwise specified.)

Symbol	Parameter	Condition	V_{CC} (V)	T_A = −40°C to +85°C			Unit
				Min	Typ	Max	
$V_{CC(HYS)}$	Supply Voltage Hysteresis				450		mV
I_{ON}	Switch ON Leakage Current	nA = −0.5 V, 0.5 V, 1.5 V, −1.5 V, nB = Float, #1S = #2S = Float	0		0.1		μA
I_{OFF}	Switch OFF Leakage Current	nA = −0.5 V, 0.5 V, 1.5 V, −1.5 V, nB = GND, #1S = #2S = V_{CC}	1.8		0.5		μA
I_{CCT}	Increase in I_{CC} for each Select Pin	#1S = V_{CC}, #2S = 1.2 V, #1S = 1.2 V, #2S = V_{CC}	3.0		7		μA
R_{ON}	Switch On Resistance	I_{SW} = 100 mA, V_{SW} = −1.5 V to +1.5 V	0		0.40	0.80	Ω
ΔR_{ON}	Switch On Resistance Difference, Channel to Channel	I_{SW} = 100 mA, V_{SW} = −1.5 V to +1.5 V	0		0.01		Ω
$R_{FLAT(ON)}$	On Resistance Flatness	I_{SW} = 100 mA, V_{SW} = −1.5 V to +1.5 V	0		0.01		Ω
R_{PD}	V_{CC} Pull−Down Resistance		<0.2		5.0		MΩ
R_{PU}	Select Pull−Up Resistance		<0.2		3.0		MΩ
I_{CC}	Quiescent Supply Current	Switch Isolated, #1S = #2S = V_{CC}	1.5 to 3.0		80		μA
		Switch On	0.2		0.5		
V_{IH}	Select Pin Input High Voltage		1.5 to 3.0	1.2			V
V_{IL}	Select Pin Input Low Voltage		1.5 to 3.0			0.55	V

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

AC ELECTRICAL CHARACTERISTICS (Typical values are for T_A = 25°C unless otherwise specified.)

Symbol	Parameter	Condition		V_{CC} (V)	T_A = −40°C to +85°C			Unit
					Min	Typ	Max	
t_{ON}	Turn−On Time V_{CC} to Output	R_L = 32 Ω, C_L = 10 pF, #nS = Float, Figure 4	W_{SW} = 1.5 V	1.8→0		450		μs
			W_{SW} = −1.5 V	1.8→0		350		
t_{OFF}	Turn−Off Time V_{CC} to Output	R_L = 32 Ω, C_L = 10 pF, #nS = Float, Figure 4	W_{SW} = 1.5 V	0→1.8		250		μs
			W_{SW} = −1.5 V	0→1.8		150		
t_{ONS}	Turn−On Time Select Pin	R_L = 32 Ω, C_L = 10 pF, #nS = V_{CC}→0, Figure 5	W_{SW} = 1.5 V	1.8		350		μs
			W_{SW} = −1.5 V	1.8		300		
t_{OFFS}	Turn−Off Time Select Pin	R_L = 32 Ω, C_L = 10 pF, #nS = 0→V_{CC}, Figure 5	W_{SW} = 1.5 V	1.8		150		μs
			W_{SW} = −1.5 V	1.8		50		
BW	−3 dB Bandwidth	V_{SW} = 600 mV_{p-p}, R_L = 50 Ω; C_L = 5 pF,		0		200		MHz
THD+N	Total Harmonic Distortion + Noise	V_{SW} = 1 V_{RMS}, R_L = 32 Ω, f = 1 kHz	Non A−weighted	0		−104		dB
			A−weighted			−107		dB
O_{IRR}	Port Off Isolation	V_{SW} = 0.707 V_{RMS}, R_L = 32 Ω, f = 20 Hz to 100 kHz, Figure 6		1.8	−70	−82		dB
X_{TALK}	Cross Talk	V_{SW} = 1 V_{RMS}, f = 100 kHz, R_L = 32 Ω		1.8		−75		dB
		V_{SW} = 1 V_{RMS}, f = 20 kHz, R_L = 32 Ω				−100		
PSRR	Power Supply Rejection Ratio	Switch Isolating, V_{Ripple} = V_{CC} + 300 mV_{p-p}, R_L = 32 Ω	217 Hz	1.8		−80		dB
			1 kHz			−77		
			20 kHz			−73		

CAPACITANCE (Typical values are for T_A = 25°C unless otherwise specified.)

Symbol	Parameter	Condition	V_{CC} (V)	T_A = −40°C to +85°C			Unit
				Min	Typ	Max	
C_{ON}	On Capacitance	V_{SW} = 400 mV_{PP}, f = 1 MHz,	0		21		pF
C_{OFF}	Off Capacitance	V_{SW} = 400 mV_{PP}, f = 1 Mhz, #1S = #2S = V_{CC}	1.8		25		pF
C_{CTRL}	Select Pin Capacitance	#nS = 400 mV_{PP}, f = 1 MHz	1.8		5		pF

TIMING DIAGRAMS

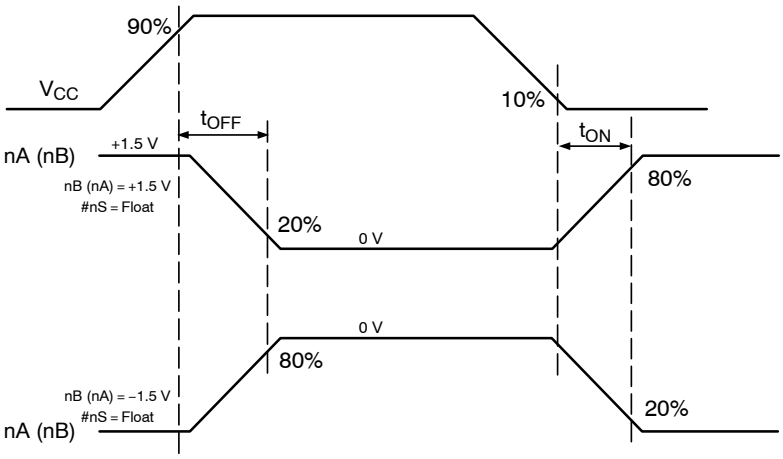


Figure 4. t_{ON}/t_{OFF} V_{CC} to Output Timing

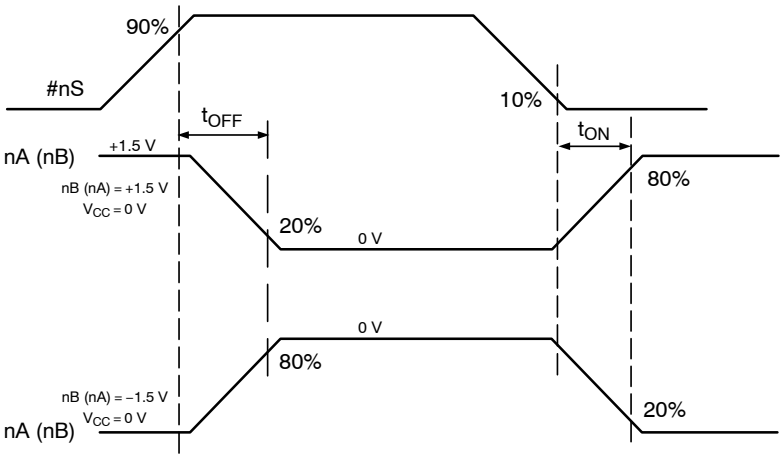
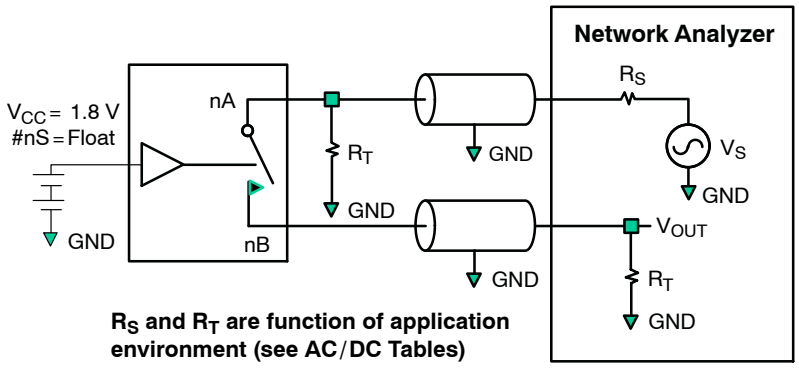


Figure 5. t_{ON}/t_{OFF} Select (#nS) to Output Timing



R_S and R_T are function of application environment (see AC/DC Tables)

OFF Isolation = 20 Log (V_{OUT}/V_{IN})

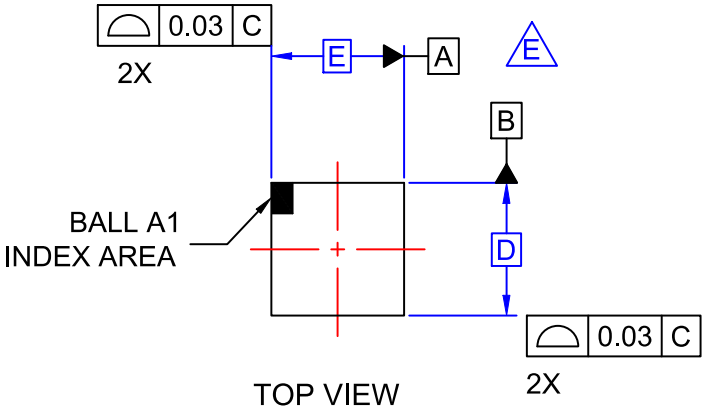
Figure 6. OFF Isolation

PRODUCT−SPECIFIC DIMENSIONS

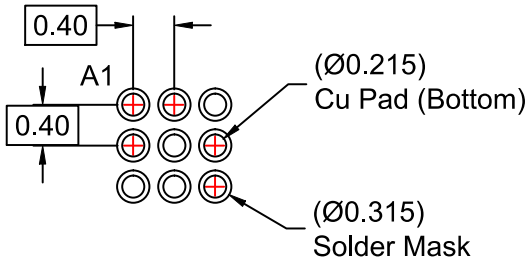
E	D	X	Y
1.215±0.03 mm	1.385±0.03 mm	0.2075	0.2925

WLCSP9 1.385x1.215x0.581
CASE 567SV
ISSUE O

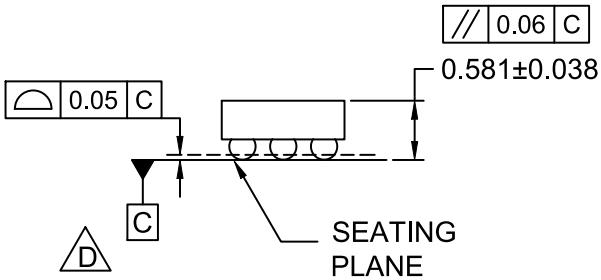
DATE 30 NOV 2016

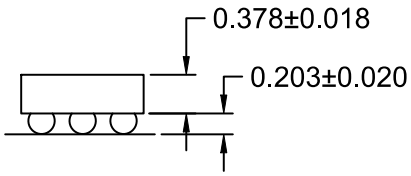


TOP VIEW

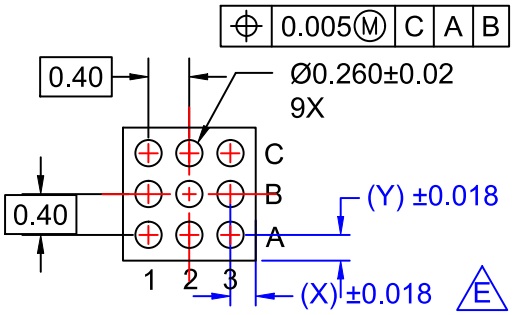


RECOMMENDED LAND PATTERN
(NSMD PAD TYPE)





SIDE VIEWS



BOTTOM VIEW

NOTES

A. NO JEDEC REGISTRATION APPLIES.
B. DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS AND TOLERANCE PER ASME Y14.5M, 2009.
D. DATUM C IS DEFINED BY THE SPHERICAL CROWNS OF THE BALLS.
E. FOR DIMENSIONS D,E,X, AND Y SEE PRODUCT DATASHEET.

DOCUMENT NUMBER:	**98AON16623G**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	**WLCSP9 1.385x1.215x0.581**	**PAGE 1 OF 1**

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Email Requests to: orderlit@onsemi.com

onsemi Website: www.onsemi.com

TECHNICAL SUPPORT
North American Technical Support:
Voice Mail: 1 800−282−9855 Toll Free USA/Canada
Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:
Phone: 00421 33 790 2910
For additional information, please contact your local Sales Representative

◊