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# FSA550 4PST Depletion Mode Isolation Switch

## Features

- 4PST (NC)
- Depletion Mode MOSFETs
- Audio Frequency Range
- $V_{CC(OFF)}$ : 1.6 V to 3.0 V
- $R_{ON}$ : 0.8  $\Omega$  Typical
- $R_{ON}$  Flat: 0.01  $\Omega$  Typical
- THD+N: 0.002% Typical
- Eco Status: Fairchild Green, RoHS Compliant, Halogen Free

## Applications

- MP3 Portable Media Players
- Cellular Phones, Smart Phones

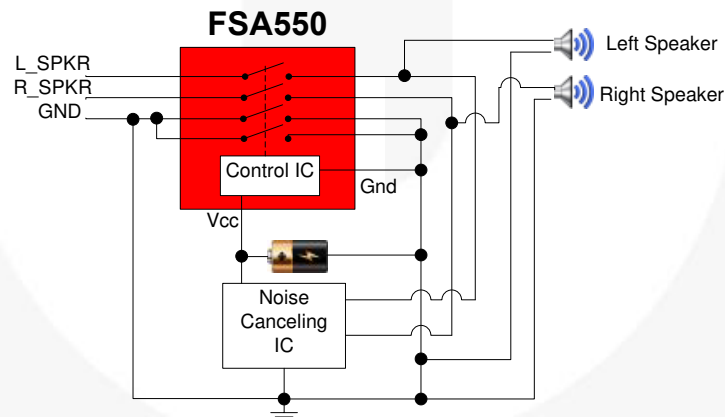
## Description

The FSA550 is a high-performance four-pole single-throw (4PST) normally closed Depletion-Mode isolation switch. The Depletion Mode technology allows the device to conduct signals when there is no  $V_{CC}$  available and to isolate the signals when  $V_{CC}$  is present.

The FSA550 operates on a wide  $V_{CC}$  range for design flexibility. Additionally, select pins allow the internal oscillator frequency to be adjusted between 500 kHz and 750 kHz in 75 kHz steps when  $V_{CC}$  is present. This feature is used to shift the electromagnetic interference (EMI) signature to meet customer specifications.

## Related Resources

- FSA550 Evaluation Board



Typical Application

## Ordering Information

Part Number	Top Mark	Operating Temperature Range	Package	Packing Method
FSA550UCX	M4	-40 to +85°C	12-Ball WLCSP, 3 x 4 Array, 0.4 mm Pitch, 250 $\mu$ m Ball	3000 Units on Tape and Reel
FSA550BUCX	M4	-40 to +85°C	12-Ball WLCSP(with Backside Laminate), 3 x 4 Array, 0.4 mm Pitch, 250 $\mu$ m Ball	3000 Units on Tape and Reel

## Pin Configuration

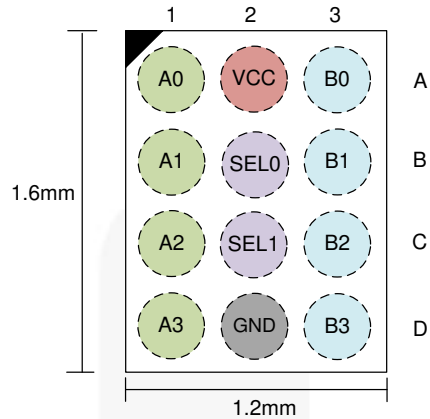


Figure 1. Pin Assignment (Top Through View)

## Pin Descriptions

Pin #	Name	Type	Description
A1	A0	I/O	A - Port
B1	A1	I/O	A - Port
C1	A2	I/O	A - Port
D1	A3	I/O	A - Port
A2	V <sub>CC</sub>	Supply / Control	Isolation Circuit Supply Voltage ( <i>see Table 1</i> )
B2	SEL0	Input	Oscillator Frequency Control ( <i>see Table 2</i> ). Used to shift the electromagnetic interference (EMI) signature to meet the customer specifications.
C2	SEL1	Input	
D2	GND	Ground	System Ground
A3	B0	I/O	B - Port
B3	B1	I/O	B - Port
C3	B2	I/O	B - Port
D3	B3	I/O	B - Port

Table 1. Truth Table

V <sub>CC</sub>	Function
0 V – 0.2 V	B0-B3 = A0-A3
1.6 V - 3.0 V	Disconnect; B0-B3 ≠ A0-A3

Table 2. Oscillator Frequency Step Logic

SEL1	SEL0	Frequency (Typ.)
LOW	LOW	500 kHz
LOW	HIGH	575 kHz
HIGH	LOW	650 kHz
HIGH	HIGH	725 kHz

## 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
$V_{CC}$	Supply/Control Voltage		0	4.6	V
$V_{IN}$	Input Voltage (Select Pins)		0	$V_{CC}$	V
$V_{SW(ON)}$	DC Switch I/O Voltage (Switch Conducting)	$V_{CC}=0$ V	-4	+4	V
$V_{SW(OFF)}^{(1)}$	DC Switch I/O Voltage (Switch Isolated)	$V_{CC}=\text{Powered}$	-0.5	3.0	V
$I_{IK}$	DC Input Diode Current		-50		mA
$I_{SW}$	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	All Pins		5.0	kV
	Charged Device Model, JEDEC: JESD22-C101			1.5	
	IEC 61000-4-2 System	Contact		8.0	
		Air Gap		15.0	
$T_A$	Absolute Maximum Operating Temperature		-40	+85	°C
$T_{STG}$	Storage Temperature		-65	+150	°C

### Note:

- When a switch is isolated (OFF),  $V_{SW}$  value must be  $< V_{CC}$ .

## 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
$V_{CC(ON)}$	Supply Voltage with Switch Conducting		0	0.2	V
$V_{CC(OFF)}$	Supply Voltage with Switch Isolated		1.6	3.0	V
$V_{SW(ON)}$	DC Switch I/O Voltage (Switch Conducting)	$V_{CC} = 0$ V	-2	2	V
$V_{SW(OFF)}$	DC Switch I/O Voltage (Switch Isolated)	$V_{CC} = 1.6$ V to 3.0 V	0	1.4	V

## DC Electrical Characteristics

Typical values at  $T_A = 25^\circ\text{C}$  unless otherwise specified.

Symbol	Parameter	Condition	$V_{CC}$ (V)	$T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$			Unit
				Min.	Typ.	Max.	
$I_{ON}$	Switch-to-GND Leakage Current (Switch Conducting)	$A_n = -1.4\text{ V}$ to $1.4\text{ V}$ , $B_n = \text{Float}$	0	0	0.3	1.0	$\mu\text{A}$
$I_{OFF}$	Switch-to-GND Leakage Current (Switch Isolated)	$A_n = 0.4\text{ V}$ to $1.4\text{ V}$ , $B_n = \text{Float}$	3	0	0.5	3.5	$\mu\text{A}$
$R_{ON}$	Switch On Resistance <sup>(2)</sup>	$I_{SW} = \pm 24\text{ mA}$ , $V_{SW} = -1.4\text{ V}$ to $+1.4\text{ V}$	0		0.8		$\Omega$
$R_{FLAT(ON)}$	On Resistance Flatness <sup>(2)</sup>	$I_{SW} = \pm 24\text{ mA}$ , $V_{SW} = -1.4\text{ V}$ to $+1.4\text{ V}$	0		0.01		$\Omega$
$I_{CC}$	Quiescent Supply Current	$SEL0 = SEL1 = V_{CC}$	3	0	50	70	$\mu\text{A}$
$V_{IH}$	Input Voltage High (Select Pins) <sup>(3)</sup>		3	$0.8 \cdot V_{CC}$			V
$V_{IL}$	Input Voltage Low (Select Pins) <sup>(3)</sup>		3			$0.2 \cdot V_{CC}$	V
$I_{IN}$	Input Leakage Current (Select Pins)		3	0		$\pm 1$	$\mu\text{A}$

### Notes:

- Guaranteed by test and characterization.
- Voltages on select control pins must be  $\leq V_{CC}$ .

## AC Electrical Characteristics

Typical values at  $T_A = 25^\circ\text{C}$  unless otherwise specified.

Symbol	Parameter	Condition	$V_{CC}$ (V)	Typ.	Unit
$t_{ON}$	Turn-On Time $V_{CC}$ to Output <sup>(4,5)</sup>	$R_L = 32\ \Omega$ , $C_L = 10\text{ pF}$ , $V_{SW} = 1.4\text{ V}$	1.6	120	ns
$t_{OFF}$	Turn-Off Time $V_{CC}$ to Output <sup>(4,5)</sup>	$R_L = 32\ \Omega$ , $C_L = 10\text{ pF}$ , $V_{SW} = 1.4\text{ V}$	1.6	160	$\mu\text{s}$
$O_{IRR}$	Off Isolation <sup>(4,5)</sup>	$R_L = 32\ \Omega$ , $f = 20\text{ kHz}$ , $V_{SW} = 0.35\text{ V}_{RMS}$	1.6	-90	dB
$X_{TALK}$	Crosstalk <sup>(4,5)</sup>	$R_L = 32\ \Omega$ , $f = 20\text{ kHz}$ , $V_{SW} = 1\text{ V}_{RMS}$	0	-90	dB
BW	-3dB Bandwidth <sup>(5)</sup>	$R_L = 50\ \Omega$ , $C_L = 0\text{ pF}$	0	<50	MHz
THD+N	Total Harmonic Distortion + Noise <sup>(4,5)</sup>	$R_L = 32\ \Omega$ , $f = 20\text{ Hz}$ to $20\text{ kHz}$ , $V_{SW} = 1\text{ V}_{RMS}$	0	0.002	%

### Notes:

- $SEL0=SEL1=LOW$ .
- Guaranteed by characterization.

## Capacitance

$T_A = 25^\circ\text{C}$  unless otherwise noted.

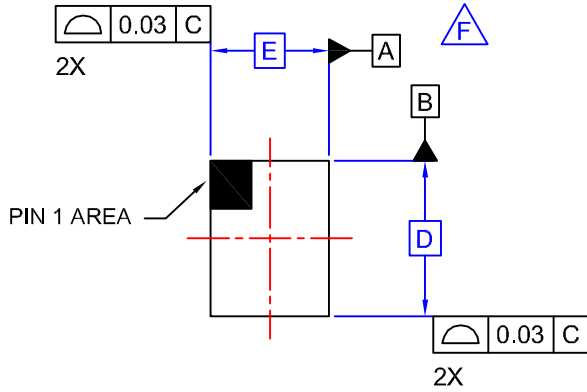
Symbol	Parameter	Condition	Typ.	Unit
$C_{ON}$	On Capacitance (Switch Conducting)	$V_{CC} = 0\text{ V}$ , $f = 1\text{ MHz}$ , $400\text{ mV}_{PP}$	10	pF
$C_{OFF}$	Off Capacitance (Switch Isolated)	$V_{CC} = 1.6\text{ V}$ , $f = 1\text{ MHz}$ , $400\text{ mV}_{PP}$	10	

**Product-Specific Dimensions**

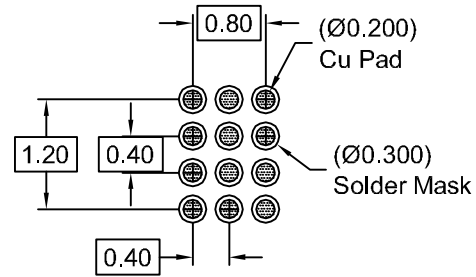
<b>E</b>	<b>D</b>	<b>X</b>	<b>Y</b>
1.16 mm	1.56 mm	0.18 mm	0.18 mm



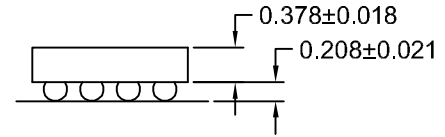
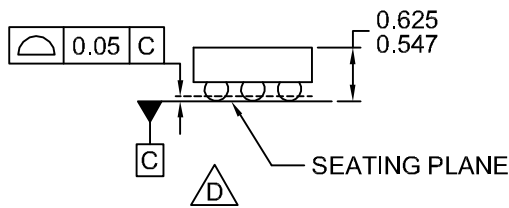
REVISIONS			
REV	DESCRIPTION	DATE	APP'D / SITE
1	Initial drawing release.	8-19-09	L. England / FSME



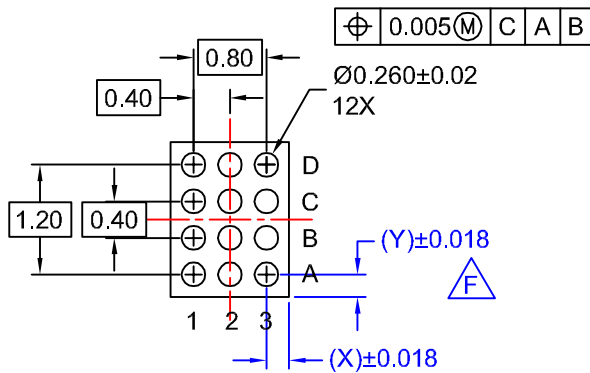
TOP VIEW



RECOMMENDED LAND PATTERN  
(NSMD PAD TYPE)



SIDE VIEWS



BOTTOM VIEW

NOTES:

- A. NO JEDEC REGISTRATION APPLIES.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
- D. DATUM C IS DEFINED BY THE SPHERICAL CROWNS OF THE BALLS.
- E. PACKAGE NOMINAL HEIGHT IS 586 MICRONS ±39 MICRONS (547-625 MICRONS).
- F. FOR DIMENSIONS D, E, X, AND Y SEE PRODUCT DATASHEET.
- G. DRAWING FILENAME: MKT-UC012ACrev1.

APPROVALS		DATE	FAIRCHILD SEMICONDUCTOR™			
DRAWN	L. England	8-19-09	12BALL WLCSP, 3X4 ARRAY 0.4MM PITCH, 250UM BALL			
DFTG. CHK.	S. Martin	8-19-09				
ENGR. CHK.						
			SCALE	SIZE	DRAWING NUMBER	REV
			N/A	N/A	MKT-UC012AC	1
			DO NOT SCALE DRAWING		SHEET 1 of 1	

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