



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 Ω Typical
- R_{ON} Flat: 0.01 Ω Typical
- THD+N: 0.002% Typical
- Eco Status: Fairchild Green, RoHS Compliant, Halogen Free

Applications

- MP3 Portable Media Players
- Cellular Phones, Smart Phones

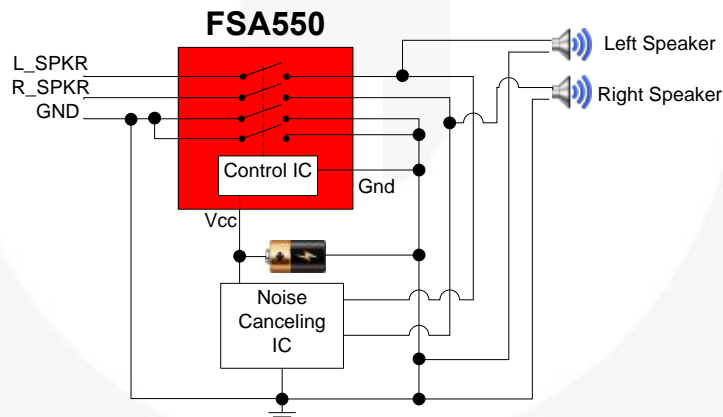
Description

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 μ 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 μ m Ball | 3000 Units on Tape and Reel |

Pin Configuration

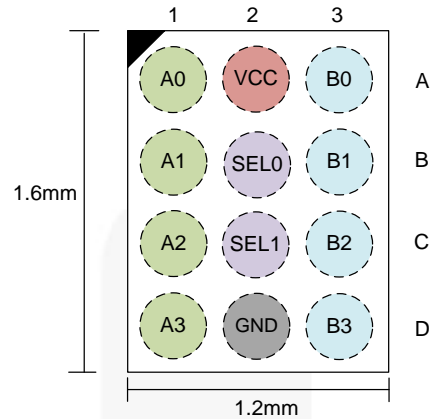


Figure 1. Pin Assignment (Top Through View)

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 _{CC} | Supply / Control | Isolation Circuit Supply Voltage (see Table 1) |
| B2 | SEL0 | Input | Oscillator Frequency Control (see Table 2). 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 _{CC} | 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) | $V_{CC}=0\text{ V}$ | -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 | $V_{CC}=0\text{ V}$ (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 | | kV |
| | Charged Device Model, JEDEC: JESD22-C101 | | | | |
| | 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) | $V_{CC} = 0\text{ V}$ | -2 | 2 | V |
| $V_{SW(OFF)}$ | DC Switch I/O Voltage (Switch Isolated) | $V_{CC} = 1.6\text{ V to }3.0\text{ V}$ | 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 V , $B_n = \text{Float}$ | 0 | 0 | 0.3 | 1.0 | μA |
| I_{OFF} | Switch-to-GND Leakage Current (Switch Isolated) | $A_n = 0.4\text{ V}$ to 1.4 V , $B_n = \text{Float}$ | 3 | 0 | 0.5 | 3.5 | μA |
| R_{ON} | Switch On Resistance ⁽²⁾ | $I_{SW} = \pm 24\text{ mA}$, $V_{SW} = -1.4\text{ V}$ to $+1.4\text{ V}$ | 0 | | 0.8 | | Ω |
| $R_{FLAT(ON)}$ | On Resistance Flatness ⁽²⁾ | $I_{SW} = \pm 24\text{ mA}$, $V_{SW} = -1.4\text{ V}$ to $+1.4\text{ V}$ | 0 | | 0.01 | | Ω |
| I_{CC} | Quiescent Supply Current | $SEL0 = SEL1 = V_{CC}$ | 3 | 0 | 50 | 70 | μA |
| V_{IH} | Input Voltage High (Select Pins) ⁽³⁾ | | 3 | $0.8 \cdot V_{CC}$ | | | V |
| V_{IL} | Input Voltage Low (Select Pins) ⁽³⁾ | | 3 | | | $0.2 \cdot V_{CC}$ | V |
| I_{IN} | Input Leakage Current (Select Pins) | | 3 | 0 | | ± 1 | μA |

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 ^(4,5) | $R_L = 32\ \Omega$, $C_L = 10\text{ pF}$, $V_{SW} = 1.4\text{ V}$ | 1.6 | 120 | ns |
| t_{OFF} | Turn-Off Time V_{CC} to Output ^(4,5) | $R_L = 32\ \Omega$, $C_L = 10\text{ pF}$, $V_{SW} = 1.4\text{ V}$ | 1.6 | 160 | μs |
| O_{IRR} | Off Isolation ^(4,5) | $R_L = 32\ \Omega$, $f = 20\text{ kHz}$, $V_{SW} = 0.35\text{ V}_{RMS}$ | 1.6 | -90 | dB |
| X_{TALK} | Crosstalk ^(4,5) | $R_L = 32\ \Omega$, $f = 20\text{ kHz}$, $V_{SW} = 1\text{ V}_{RMS}$ | 0 | -90 | dB |
| BW | -3dB Bandwidth ⁽⁵⁾ | $R_L = 50\ \Omega$, $C_L = 0\text{ pF}$ | 0 | <50 | MHz |
| THD+N | Total Harmonic Distortion + Noise ^(4,5) | $R_L = 32\ \Omega$, $f = 20\text{ Hz}$ to 20 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.

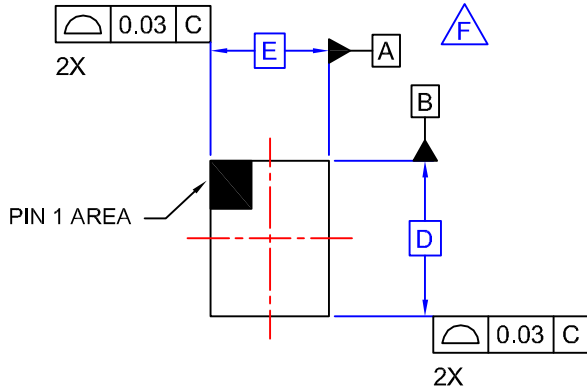
| Symbol | Parameter | Condition | Typ. | Unit |
|-----------|------------------------------------|---|------|------|
| C_{ON} | On Capacitance (Switch Conducting) | $V_{CC} = 0\text{ V}$, $f = 1\text{ MHz}$, 400 mV_{PP} | 10 | pF |
| C_{OFF} | Off Capacitance (Switch Isolated) | $V_{CC} = 1.6\text{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

Product-Specific Dimensions

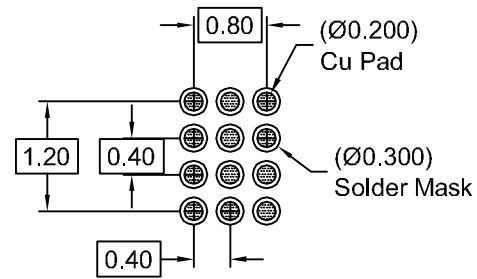
| E | D | X | Y |
|---------|---------|---------|---------|
| 1.16 mm | 1.56 mm | 0.18 mm | 0.18 mm |



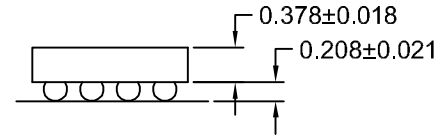
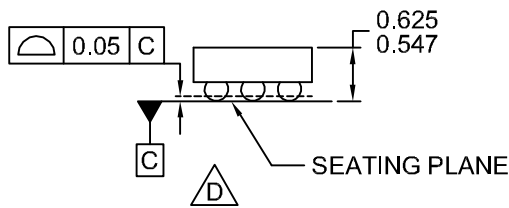
| REVISIONS | | | |
|-----------|--------------------------|---------|-------------------|
| REV | DESCRIPTION | DATE | APP'D / SITE |
| 1 | Initial drawing release. | 8-19-09 | L. England / FSME |



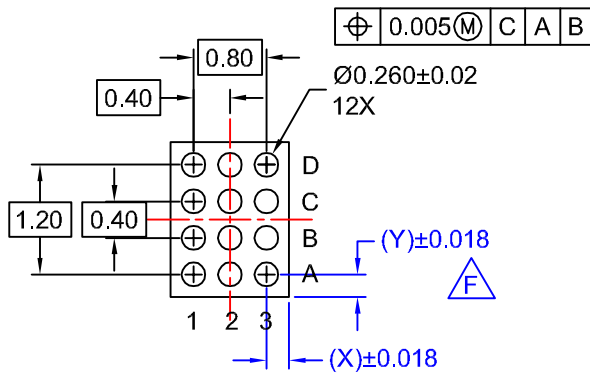
TOP VIEW



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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