



# FSA8038

## Audio Jack Detection and Configuration Switch with Moisture Sensing

### Features

Detection	Accessory Plug-In 3-Pole or 4-Pole Audio Jack Send/End Key Pressed Moisture
Switch Type	MIC
V <sub>DD</sub>	2.5 V to 4.5 V
V <sub>IO</sub>	1.6 to V <sub>DD</sub>
THD (MIC)	0.01% Typical
ESD (Air Gap)	15 kV
Operating Temperature	-40°C to 85°C
Package	10-Lead UMLP 1.4 mm × 1.8 mm × 0.5 mm, 0.4 mm Pitch
Top Mark	NB
Ordering Information	FSA8038UMSX_F106 (Preliminary)

### Applications

- 3.5 mm and 2.5 mm Audio Jacks
- Cellular Phones, Smart Phones
- MP3 and PMP

### Description

The FSA8038 is an audio jack detector and switch for 3-pole or 4-pole accessories. In addition to detection, the FSA8038 features moisture sensing, which prevents false audio jack detection. The FSA8038 also features an integrated MIC switch that allows a processor to configure attached accessories. The architecture is designed to allow common third-party headphones to be used for listening to music from mobile handsets, personal media players, and portable peripheral devices.

- Removes Audio Jack Pop-n-Click Caused by MIC Bias
- Prevents False Detection of Accessories in the Audio Jack when Moisture is Present
- Detects Audio Jack Accessories:
  - Standard Headphones
  - Send / End Button Presses
- Integrates a MIC Switch for 4-Pole Configuration

### Related Resources

- [FSA8038 Evaluation Board](#)
- *For samples and questions, please contact:*  
[Analog.Switch@fairchildsemi.com](mailto:Analog.Switch@fairchildsemi.com)

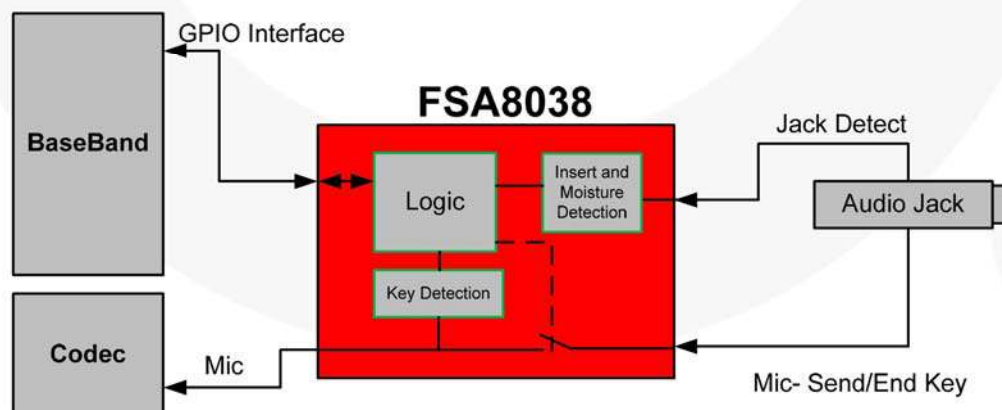


Figure 1. System Diagram

## Pin Configuration

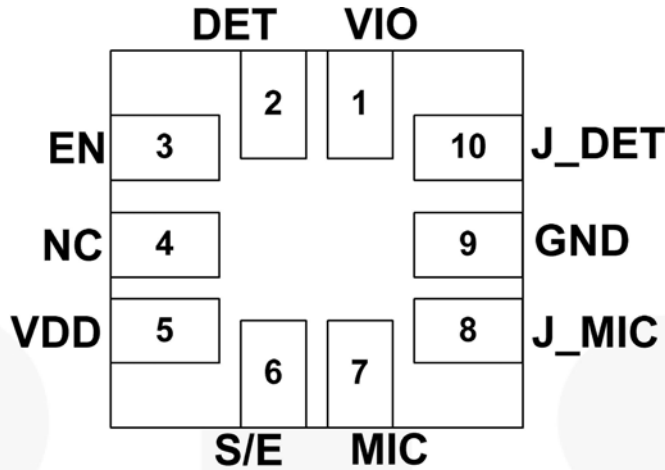


Figure 2. Pin Assignment (Through View)

## Pin Definitions

Name	Pin #	Type	Description	
DET	2	Output	Indicates if audio jack is plugged in as detected on J_DET pin.	DET = L, Plugged DET = H, Unplugged
NC	4	N/C	No Connect/ Connect to ground for improved solder stability	
H/K (S/E)	6	Output	Indicates state of Headset Key for a 4 pole jack key has been pressed	S/E = L, No Key Press S/E = H, Key Press
EN	3	Input	Controls internal microphone switch between J_MIC and MIC pins	EN = L, Switch is Open EN = H, Switch is Closed
J_DET	10	Input	Input from a pin of the audio jack socket that is tied to a mechanical switch that typically closes whenever an audio jack is inserted into that socket	J_DET = H, Unplugged J_DET = L, Plugged
MIC	7	Switch	Microphone switch path that goes to the CODEC microphone amplifier input	EN = L, Switch Open EN = H, Switch Closed
J_MIC	8	Switch	Microphone Switch path that connects to the microphone and SEND/END key audio jack pole.	
V <sub>DD</sub>	5	Power	Core Supply Voltage	
V <sub>IO</sub>	1	Power	Baseband I/O Supply Voltage	
GND	9	Ground	Ground for both the audio jack and the PCB	

## 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	
$V_{DD}, V_{IO}$	Supply Voltage from Battery	-0.5	6.0	V	
$V_{SW}$	Switch I/O Voltage for "S" Switch and All Input Voltages Except J_DET	-0.5	$V_{DD}+0.5$	V	
$V_{JD}$	Input Voltage for J_DET Input	-1.5	$V_{DD}+0.5$	V	
$I_{IK}$	Input Clamp Diode Current	-50		mA	
$I_{SW}$	Switch I/O Current (Continuous)		50	mA	
$T_{STG}$	Storage Temperature Range	-65	+150	C	
$T_J$	Maximum Junction Temperature		+150	C	
$T_L$	Lead Temperature (Soldering, 10 Seconds)		+260	C	
ESD	IEC 61000-4-2 System ESD	Air Gap	15		kV
		Contact	8		
	JEDEC JESD22-A114, Human Body Model	J_DET, J_MIC, $V_{DD}$ , $V_{IO}$ , GND	8		
		All other pins	4		
	JEDEC JESD22-C101, Charged Device Model	All Pins	1		

**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
$V_{DD}$	Battery Supply Voltage	2.5	4.5	V
$V_{IO}$	Parallel I/O Supply Voltage	1.6	$V_{DD}$	V
$T_A$	Operating Temperature	-40	+85	°C

## DC Electrical Characteristics

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

Symbol	Parameter	$V_{DD}$ (V)	Conditions	$T_A = -40$ to $+85^\circ\text{C}$			Units
				Min.	Typ.	Max.	
<b>MIC Switch</b>							
$R_{ON}$	MIC Switch On Resistance	2.8	$I_{OUT} = 30\text{ mA}$ , $V_{IN} = 2.2\text{ V}$		2.0	2.0	$\Omega$
		3.0			1.5	2.0	
		3.3			1.2	2.0	
		3.8			1.0	2.0	
$R_{FLAT(ON)}$	On Resistance Flatness	2.8	$I_{OUT} = 30\text{ mA}$ , $V_{IN} = 1.6$ to $2.8\text{ V}$			1.5	
		3.0				1.5	
		3.3				1.5	
		3.8				1.5	
$V_{IN}$	Switch Input Voltage Range	2.5 to 4.5		0		$V_{DD}$	V
$C_{ON}$	MIC and J_MIC Switch ON Capacitance	3.8	$f = 1\text{ MHz}$		80		pF
$C_{OFF}$	MIC and J_MIC Switch OFF Capacitance	3.8	$f = 1\text{ MHz}$		30		pF
<b>J_DET</b>							
$J\_DET_{AudioV}$	Audio Voltage Range on J_DET Pin	2.5 to 4.5	DET = LOW	-1		1	V
$J\_DET_{Audiof}$	Audio Frequency on J_DET Pin	2.5 to 4.5	DET = LOW	20		20000	Hz
$J\_DET_{RGND}$	Detection Resistance to Ground	2.5 to 4.5	Audio Jack Inserted	0		500	k $\Omega$
$J\_DET_{HYS}$	Hysteresis of J_DET				200		mV
$J\_DET_{VIH}$	Input High Voltage			$0.7 \times V_{DD}$		$V_{DD}$	V
$J\_DET_{VIL}$	Input Low Voltage			-1		$0.4 \times V_{DD}$	V
<b>Parallel I/O</b>							
$V_{IH}$	Input High Voltage			$0.7 \times V_{IO}$		$V_{IO}$	V
$V_{IL}$	Input Low Voltage					$0.3 \times V_{IO}$	
$V_{OH}$	Output High Voltage		$I_{OH} = -100\ \mu\text{A}$	$0.8 \times V_{IO}$			
$V_{OL}$	Output Low Voltage		$I_{OL} = +100\ \mu\text{A}$			$0.2 \times V_{IO}$	
<b>Comparator</b>							
$V_{COMP\_S/E}$	Comparator Threshold for SEND/END Sensing	3.2 to 4.5	J_DET, EN = LOW		780		mV
<b>Current</b>							
$I_{OFF}$	Power Off Leakage Current Through Switch	0	MIC, J_MIC Ports $V_{IN} = 4.3\text{ V}$			1	$\mu\text{A}$
$I_{IN}$	Input Leakage Current	0	Inputs $V_{IN} = 4.3\text{ V}$			1	$\mu\text{A}$
$I_{CC-SLNA}$	Battery Supply Sleep Mode Current No Accessory Attached	2.5 to 4.5	Static Current During Sleep Mode (EN = LOW)		2	3	$\mu\text{A}$
$I_{CC-SLWA}$	Battery Supply Sleep Mode Current with Accessory Attached	2.5 to 4.4	Active Current (EN = LOW and/or DET = HIGH)		15	25	$\mu\text{A}$

### AC Electrical Characteristics

All typical values are for  $V_{CC}=3.3\text{ V}$  at  $T_A=25^\circ\text{C}$  unless otherwise specified.

Symbol	Parameter	$V_{DD}$ (V)	Conditions	$T_A = -40$ to $+85^\circ\text{C}$			Unit
				Min.	Typ.	Max.	
<b>MIC Switch</b>							
THD	Total Harmonic Distortion	3.8	$R_T = 600\ \Omega$ , $V_{SW} = 0.5\ V_{PP}$ , $f = 20\ \text{Hz}$ to $20\ \text{kHz}$ , $V_{IN} = 2.2\ \text{V}$		0.01		%
$O_{IRR}$	Off Isolation	3.8	$f = 20\ \text{kHz}$ , $R_S = 32\ \Omega$ , $C_L = 0\ \text{pF}$ , $R_T = 32\ \Omega$		-90		dB
<b>Parallel I/O</b>							
$t_R, t_F$	Output Edge Rates (DET, S/E)	3.8	$C_L = 5\ \text{pF}$ , 20% to 80%		15		ns
$t_{POLL}$	On Time of MIC Switch for Sensing SEND/END Button Press Oscillator Stable Time	2.5 to 4.5			1		ms
$t_{WAIT}$	Period of MIC Switching Time for Sensing SEND/END Button Press	2.5 to 4.5			10		ms
$t_{DET\_IN}$	Debounce Time after J_DET Changes State from High to Low	2.5 to 4.5			250		ms
$t_{DET\_REM}$	Debounce Time after J_DET Changes State from Low to High	2.5 to 4.5			30		$\mu\text{s}$
$t_{KBK}$	Debounce Time for Sensing SEND/END Key Press / Release	2.5 to 4.5			30		ms
<b>Power</b>							
PSRR	Power Supply Rejection Ratio	3.8	Power Supply Noise $300\ \text{mV}_{PP}$ , Measured $10/90\%$ , $f = 217\ \text{Hz}$		-80		dB

Physical Dimensions

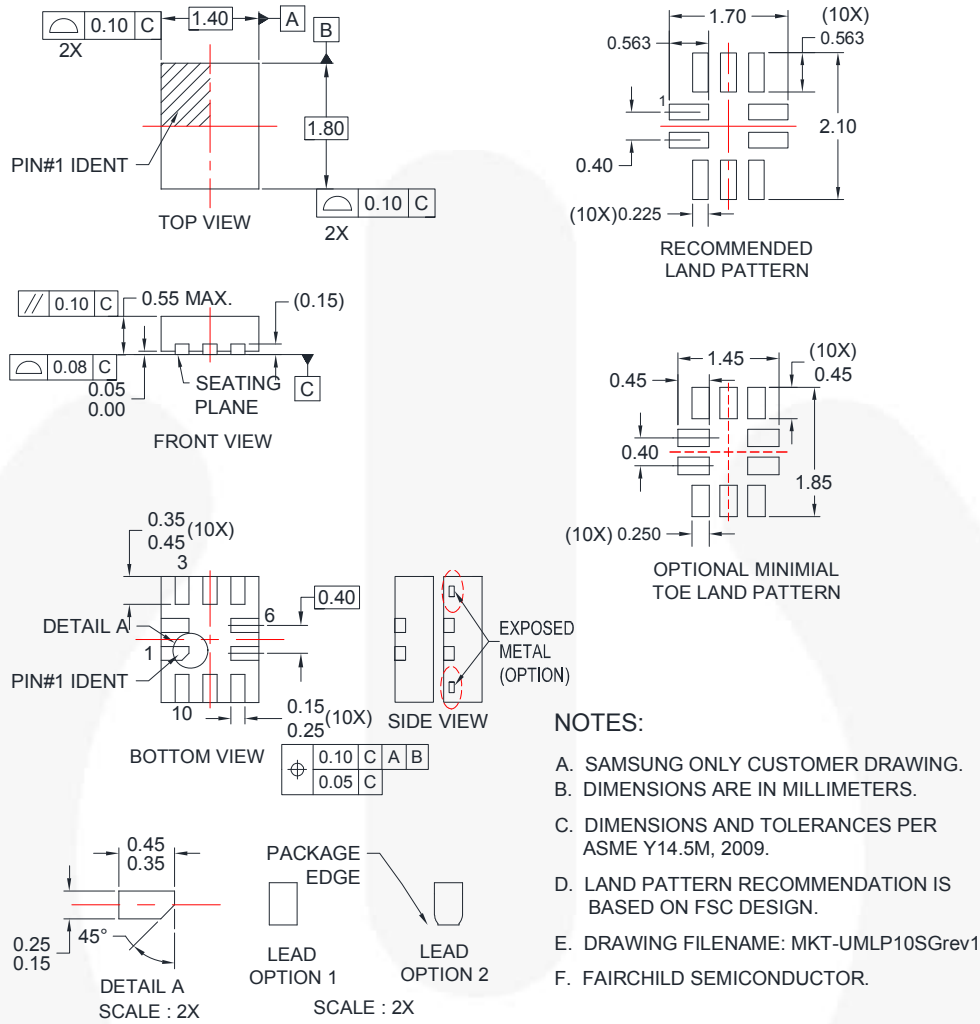


Figure 3. 10-Lead UMLP Package Drawing

Table 1. Nominal Values

JEDEC Symbol	Description	Nominal Values (mm)
A	Overall Height	0.5
A1	Package Standoff	0.026
A3	Lead Thickness	0.152
b	Lead Width	0.2
L	Lead Length	0.4
e	Lead Pitch	0.4
D	Body Length (Y)	1.8
E	Body Width (X)	1.4

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Rev. I64