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SEMICONDUCTOR®

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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_{DD}	2.5 V to 4.5 V
V_{IO}	1.6 to V_{DD}
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:*
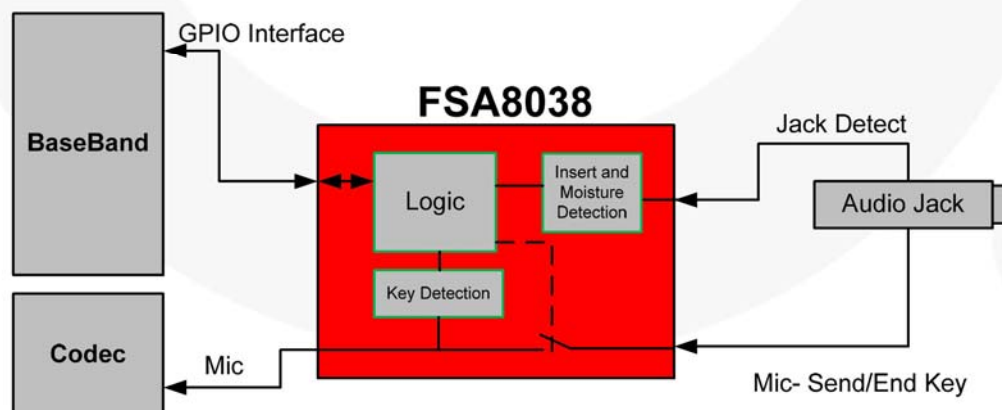 *Analog.Switch@fairchildsemi.com*
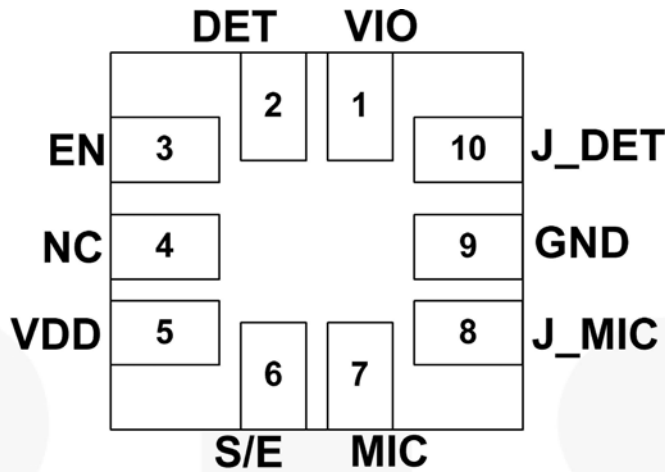

Figure 1. System Diagram

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_{DD}	5	Power	Core Supply Voltage	
V_{IO}	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:

1. 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	ºC

DC Electrical Characteristics

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

Symbol	Parameter	V_{DD} (V)	Conditions	T_A = -40 to +85°C Min.	Typ.	Max.	Units
MIC Switch							
R_{ON}	MIC Switch On Resistance	2.8	I_{OUT} = 30 mA, V_{IN} = 2.2 V		2.0	2.0	Ω
		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 mA, V_{IN} = 1.6 to 2.8 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 MHz		80		pF
C_{OFF}	MIC and J_MIC Switch OFF Capacitance	3.8	f = 1 MHz		30		pF
J_DET							
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	kΩ
J_DET_{HYS}	Hysteresis of J_DET				200		mV
J_DET_{VIH}	Input High Voltage			0.7 × V_{DD}		V_{DD}	V
J_DET_{VIL}	Input Low Voltage			-1		0.4 × V_{DD}	V
Parallel I/O							
V_{IH}	Input High Voltage			0.7 × V_{IO}		V_{IO}	V
V_{IL}	Input Low Voltage					0.3 × V_{IO}	
V_{OH}	Output High Voltage		I_{OH} = -100 µA	0.8 × V_{IO}			
V_{OL}	Output Low Voltage		I_{OL} = +100 µA			0.2 × V_{IO}	
Comparator							
$V_{COMP\_S/E}$	Comparator Threshold for SEND/END Sensing	3.2 to 4.5	J_DET, EN = LOW		780		mV
Current							
I_{OFF}	Power Off Leakage Current Through Switch	0	MIC, J_MIC Ports V_{IN} = 4.3 V			1	µA
I_{IN}	Input Leakage Current	0	Inputs V_{IN} = 4.3 V			1	µA
$I_{CC-SLNA}$	Battery Supply Sleep Mode Current No Accessory Attached	2.5 to 4.5	Static Current During Sleep Mode (EN = LOW)		2	3	µA
$I_{CC-SLWA}$	Battery Supply Sleep Mode Current with Accessory Attached	2.5 to 4.4	Active Current (EN = LOW and/or DET = HIGH)		15	25	µA

AC Electrical Characteristics

All typical values are for V_{CC}=3.3 V at T_A=25°C unless otherwise specified.

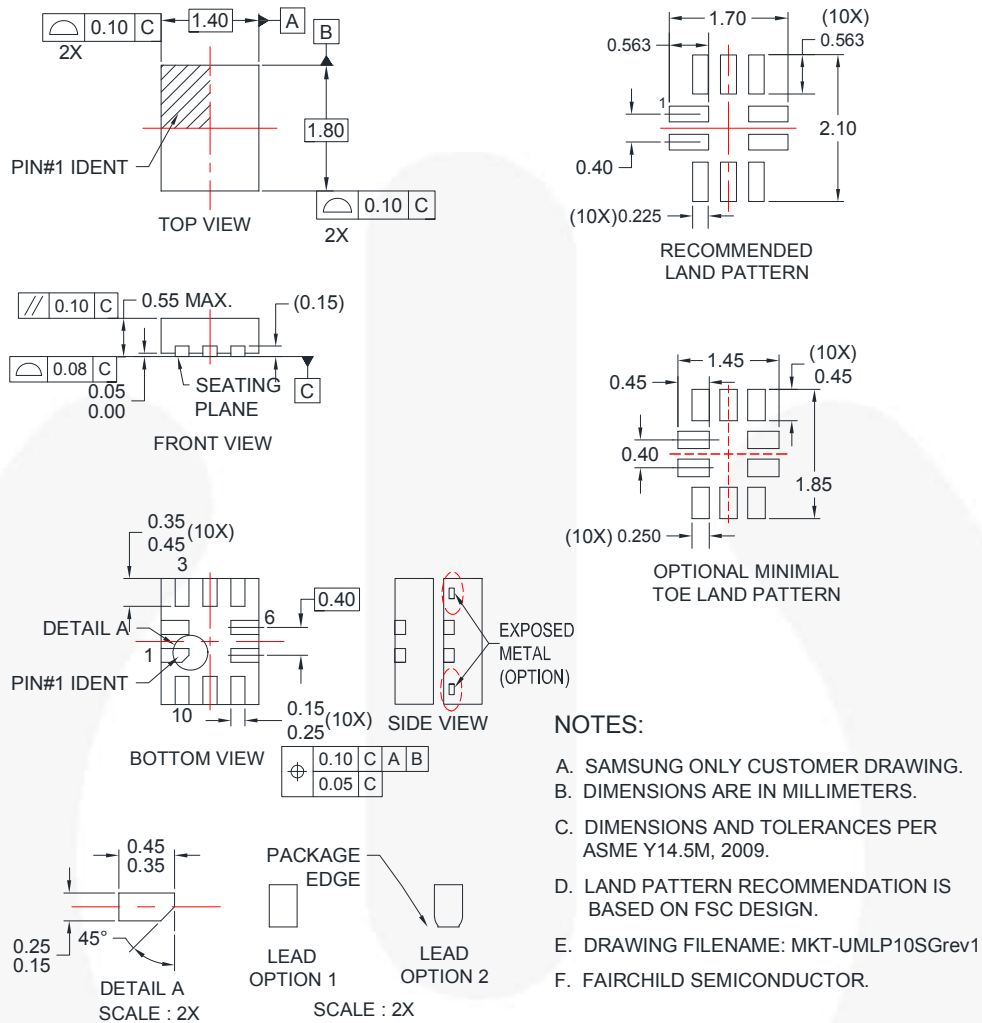| Symbol	Parameter	V_{DD} (V)	Conditions	T_A = -40 to +85°C			Unit
				Min.	Typ.	Max.	
MIC Switch							
THD	Total Harmonic Distortion	3.8	R_T = 600 Ω, V_{SW} = 0.5 V_{PP}, f = 20 Hz to 20 kHz, V_{IN} = 2.2 V		0.01		%
O_{IRR}	Off Isolation	3.8	f = 20 kHz, R_S = 32 Ω, C_L = 0 pF, R_T = 32 Ω		-90		dB
Parallel I/O							
t_R, t_F	Output Edge Rates (DET, S/E)	3.8	C_L = 5 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		µs
t_{KBK}	Debounce Time for Sensing SEND/END Key Press / Release	2.5 to 4.5			30		ms
Power							
PSRR	Power Supply Rejection Ratio	3.8	Power Supply Noise 300 mV_{PP}, Measured 10/90%, f = 217 Hz		-80		dB

Physical Dimensions

TOP VIEW

FRONT VIEW

BOTTOM VIEW

DETAIL A
SCALE : 2X

RECOMMENDED LAND PATTERN

OPTIONAL MINIMIAL TOE LAND PATTERN

SIDE VIEW

EXPOSED METAL (OPTION)

PACKAGE EDGE

LEAD OPTION 1

LEAD OPTION 2

SCALE : 2X

NOTES:

A. SAMSUNG ONLY CUSTOMER DRAWING.
B. DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
D. LAND PATTERN RECOMMENDATION IS BASED ON FSC DESIGN.
E. DRAWING FILENAME: MKT-UMLP10SGrev1
F. FAIRCHILD SEMICONDUCTOR.

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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