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July 2013

# FSA8058 Audio Jack Detection and Configuration Switch with Moisture Sensing

#### **Features**

Detection	3-Pole or 4-P	essory Plug-In ole Audio Jack d Key Pressed Moisture		
Switch Type		MIC		
$V_{DD}$		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	FSA8058	NC		
Ordering Information		FSA8058UMX		

# **Applications**

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

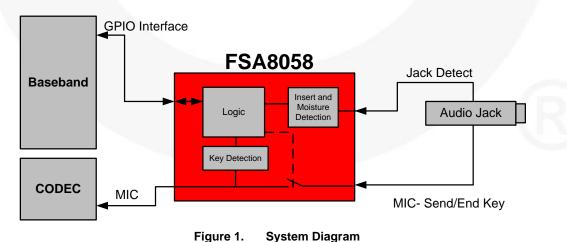
## Description

The FSA8058 is an audio jack detection switch for 3-pole and 4-pole accessories. The FSA8058 features moisture sensing, which prevents false positive detection of accessories in the audio jack. The FSA8058 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.

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

#### **Related Resources**

- FSA8058 Evaluation Board
- For samples and questions, please contact:
   Analog.Switch @fairchildsemi.com



# **Pin Configuration**

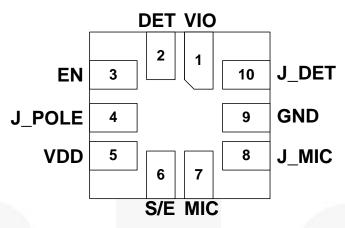


Figure 2. Pin Assignment (Through View)

# **Pin Definitions**

Name	Pin#	Туре	Description				
DET	0	Quitnut	Indicates if audio jack is plugged in as detected on	DET = LOW, Plugged			
DET	2 Output		J_DET pin	DET = HIGH, Unplugged			
JPOLE	4		JPOLE = LOW, 4-Pole Jack				
JPOLE	4	Output	Indicates if audio jack is a 3-pole jack or a 4-pole jack	JPOLE = HIGH, 3-Pole Jack			
C/F		Output	Indicates state of SEND/END for a 4-pole accessory	S/E = LOW, No Key Press			
S/E	6	Output	when a key has been pressed	S/E = HIGH, Key Press			
FN	0 1	2 Innut	3 Input Controls internal microphone switch between the J_MIC	EN = LOW, Switch Open			
□IN	EN 3 Input		and MIC pins	EN = HIGH, Switch Closed			
			Input from a pin of the audio jack socket tied to a	J_DET = HIGH, Unplugged			
J_DET	10	Input	mechanical switch that typically closes whenever an audio jack is inserted into that socket	J_DET = LOW, Plugged			
MIC	7	Switch Microphone switch path that goes to the CODEC		EN = LOW, Switch Open			
IVIIC	1	Switch	microphone amplifier input	EN = HIGH, Switch Closed			
I MIC	0	Switch	Microphone switch path that connects to the microphone	EN = LOW, Switch Open			
J_IVIIC	J_MIC 8 Switch		and SEND/END key audio jack pole	EN = HIGH, Switch Closed			
VDD	5	Power	Core supply voltage				
VIO	1	Power	Baseband I/O supply voltage				
GND	9	Ground	Ground for both the audio jack and the PCB				

# **Operation and Application Description**

#### **Moisture Issue**

Mobile device manufacturers today face a customer experience issue when liquid/moisture enters the audio jack connector housing and causes electrical shorts between metal connectors. The mobile device recognizes it as an accessory insert, resulting in the mobile device rerouting all the audio signals though the audio jack path, where the end user loses all audio function on the device.

#### **Moisture Detection**

The FSA8058 automatically detects moisture on the J\_DET pin. If there is moisture, the device enters Moisture Mode and monitors for a real accessory insert. It remains in Moisture Mode until the device no longer detects moisture on the J\_DET pin.

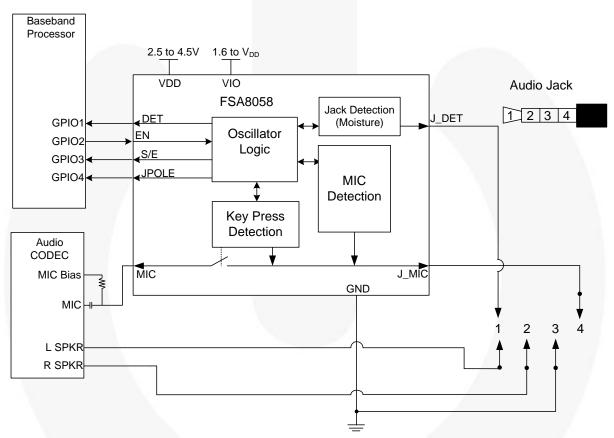


Figure 3. Typical Application Diagram

# **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
Vsw	Switch I/O Voltage for "S" Switch, All Input Volta	iges Except J_DET	-0.5	V <sub>DD</sub> +0.5	V
$V_{JD}$	Input Voltage for J_DET Input		-1.5	V <sub>DD</sub> +0.5	V
I <sub>IK</sub>	Input Clamp Diode Current		-50		mA
I <sub>SW</sub>	Switch I/O Current (Continuous)			50	mA
T <sub>STG</sub>	Storage Temperature Range		-65	+150	°C
TJ	Maximum Junction Temperature			+150	°C
TL	Lead Temperature (Soldering, 10 Seconds)			+260	°C
	IFC 61000 4 2 System FSD	Air Gap	15.0		
	IEC 61000-4-2 System ESD	Contact	8.0		
ESD	IEDEC IEED22 A444 Human Badu Madal	All Pins	7.5		kV
- 6	JEDEC JESD22-A114, Human Body Model	J_DET, J_MIC, V <sub>DD</sub> , V <sub>IO</sub>	12.0		
	JEDEC JESD22-C101, Charged Device Model	All Pins	2.0		

# **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		Max.	Unit
$V_{DD}$	Battery Supply Voltage	2.5	4.5	V
V <sub>IO</sub>	Parallel I/O Supply Voltage		$V_{DD}$	V
T <sub>A</sub>	Operating Temperature	-40	+85	°C

# **DC Electrical Characteristics**

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

Cumbal	Darameter	V 00	0 11:01	T <sub>A</sub> =	-40 to +	·85°C	11:4
Symbol	Parameter	V <sub>DD</sub> (V)	Condition	Min.	Тур.	Max.	Uni
MIC Switch				ı	I.		
		2.8			0.85	2.00	
$R_{ON}$	MIC Switch On Resistance	3.0	$I_{OUT} = 30 \text{ mA},$		0.70	2.00	
NON	WIC SWILCH OH RESISTANCE	3.3	$V_{IN} = 2.2 \text{ V}$		0.50	2.00	
		3.8			0.40	2.00	Ω
		2.8			0.45	1.50	12
R <sub>FLAT(ON)</sub>	On Resistance Flatness	3.0	$I_{OUT} = 30 \text{ mA},$		0.40	1.50	ļ
NFLAT(ON)	Off Resistance Flathess	3.3	$V_{IN} = 1.6 \text{ to } 2.8 \text{ V}$		0.35	1.50	
		3.8			0.30	1.50	
$V_{IN}$	Switch Input Voltage Range	2.5 to 4.5	\ \	0		$V_{DD}$	V
C <sub>ON</sub>	MIC and J_MIC Switch ON Capacitance	3.8	f = 1 MHz		60		рF
C <sub>OFF</sub>	MIC and J_MIC Switch OFF Capacitance	3.8	f = 1 MHz		35		pF
J_MIC		•			•		
J_MIC <sub>AudioV</sub>	Audio Voltage Range on J_MIC Pin	2.5 to 4.5	DET = LOW	0		3	V
J_MIC <sub>Audiof</sub>	Audio Frequency on J_MIC Pin	2.5 to 4.5	DET = LOW	20		20000	Hz
J_MIC <sub>RGND2</sub>	Detection Resistance to Ground	•		1250			Ω
J_MIC <sub>HYS</sub>	Hysteresis of J_MIC				60		mV
J_MIC <sub>VIH</sub>	Input High Voltage	E		0.3			V
J_MIC <sub>VIL</sub>	Input Low Voltage			-0.5		1.0	V
J_DET							
J_DET <sub>AudioV</sub>	Audio Voltage Range on J_DET Pin	2.5 to 4.5	DET = LOW	-1		1	V
J_DET <sub>Audiof</sub>	Audio Frequency on J_DET Pin	2.5 to 4.5	DET = LOW	20		20000	Hz
J_DET <sub>RGND</sub>	Detection Resistance to Ground	2.5 to 4.5	Audio Jack Inserted	0		500	kΩ
J_DET <sub>HYS</sub>	Hysteresis of J_DET				200		mV
J_DET <sub>VIH</sub>	Input High Voltage			0.7 x V <sub>DD</sub>	y.	V <sub>DD</sub>	٧
J_DET <sub>VIL</sub>	Input Low Voltage			-1.0		0.4 × V <sub>DD</sub>	V
Parallel I/O						V.	
$V_{IH}$	Input High Voltage			0.7 x V <sub>IO</sub>		V <sub>IO</sub>	
$V_{IL}$	Input Low Voltage					0.3 × V <sub>IO</sub>	
V <sub>OH</sub>	Output High Voltage		I <sub>OH</sub> = -100 μA	0.8 × V <sub>IO</sub>			V
V <sub>OL</sub>	Output Low Voltage		I <sub>OL</sub> = +100 μA			0.2 × V <sub>IO</sub>	

Continued on the following page...

# **DC Electrical Characteristics**

All typical values are at T<sub>A</sub>=25°C unless otherwise specified.

Cumbal	Parameter	V <sub>DD</sub> (V)	Condition	$T_A = -40 \text{ to } +85^{\circ}\text{C}$			l lm:4
Symbol			Condition	Min.	Тур.	Max.	Unit
Comparator							
V <sub>COMP_S/E</sub>	Comparator Threshold for SEND / END Sensing	2.8 to 4.5	J_DET, EN = LOW		780		mV
Current							
l <sub>OFF</sub>	Power-Off Leakage Current Through Switch	0	MIC, J_MIC, Ports V <sub>IN</sub> = 4.3 V			1	μA
I <sub>IN</sub>	Input Leakage Current	0	Inputs V <sub>IN</sub> = 4.3 V			1	μΑ
I <sub>CC-SLNA</sub>	Battery Supply Sleep Mode Current No Accessory Attached	2.5 to 4.5	Static Current During Sleep Mode (EN = LOW)		1.5	3.0	μΑ
I <sub>CC-SLWA</sub>	Battery Supply Sleep Mode Current with Accessory Attached	2.5 to 4.4	Active Current (EN = LOW and/or DET = HIGH)		20	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	Typical	Unit
MIC Swite	ch			•	
THD	Total Harmonic Distortion	3.8	$R_T = 600 \Omega$ , $V_{SW} = 0.5 V_{PP}$ , $f = 20 Hz$ to $20 kHz$ , $V_{IN} = 2.2 V$	0.01	%
O <sub>IRR</sub>	Off Isolation	3.8	$\begin{split} f &= 20 \text{ kHz},  R_S = 32  \Omega, \\ C_L &= 0 \text{ pF},  R_T = 32  \Omega \end{split}$	-85	dB
Parallel I/	0				
t <sub>R</sub> , t <sub>F</sub>	Output Edge Rates (DET, S/E)	3.8	C <sub>L</sub> = 5 pF, 20% to 80%, -40°C to 85°C	20	ns
t <sub>POLL</sub>	On Time of MIC Switch for Sensing SEND / END Button Press Oscillator Stable Time	2.5 to 4.5		1	ms
t <sub>WAIT</sub>	Period of MIC Switching Time for Sensing SEND / END Button Press	2.5 to 4.5		10	ms
t <sub>DET_IN</sub>	Debounce Time after J_DET Changes State from HIGH to LOW	2.5 to 4.5		100	ms
t <sub>DET_REM</sub>	Debounce Time after J_DET Changes State from LOW to HIGH	2.5 to 4.5		1	ms
t <sub>KBK</sub>	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 <sub>PP</sub> , Measured 10/90%, f = 217 Hz	-80	dB

# **Physical Dimensions**

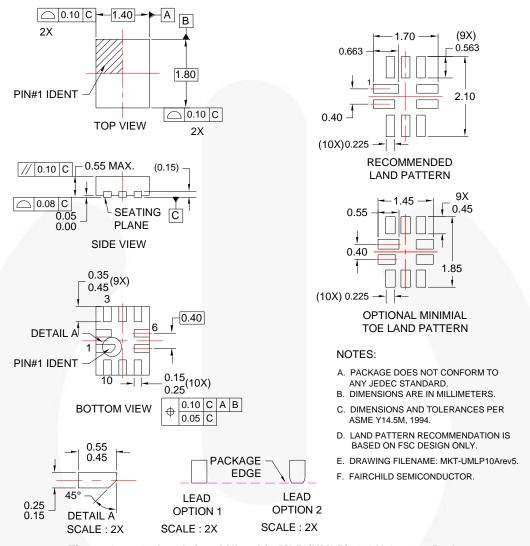


Figure 4. 10-Lead, Quad Ultrathin MLP (UMLP), 1.4 X 1.8 mm Body

Table 1. Nominal Values

JEDEC Symbol	Description	Nominal Values (mm)
A	Overall Height	0.5
A1	Package Standoff	0.072
A3	Lead Thickness	0.152
b	Lead Width	0.4
L	Lead Length	0.2
е	Lead Pitch	0.4
D	Body Length (Y)	1.8
E	Body Width (X)	1.4

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