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# FSA8058

## 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	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](mailto:Analog.Switch@fairchildsemi.com)*

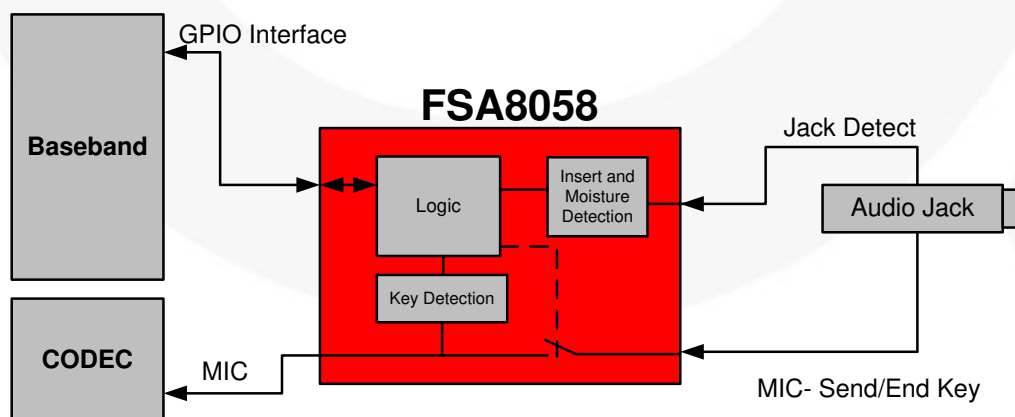


Figure 1. System Diagram

## Pin Configuration

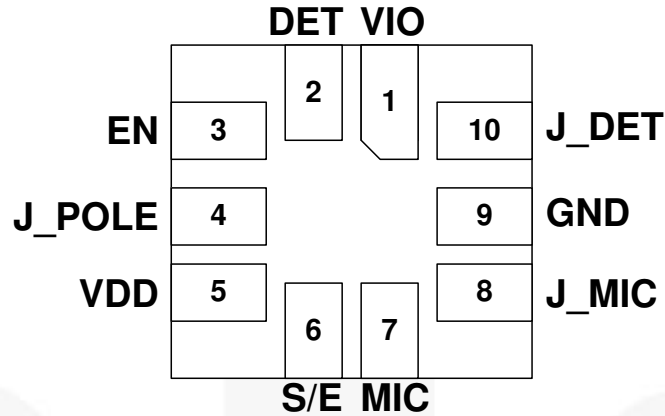


Figure 2. Pin Assignment (Through View)

## Pin Definitions

Name	Pin #	Type	Description	
DET	2	Output	Indicates if audio jack is plugged in as detected on J_DET pin	DET = LOW, Plugged
				DET = HIGH, Unplugged
JPOLE	4	Output	Indicates if audio jack is a 3-pole jack or a 4-pole jack	JPOLE = LOW, 4-Pole Jack
				JPOLE = HIGH, 3-Pole Jack
S/E	6	Output	Indicates state of SEND/END for a 4-pole accessory when a key has been pressed	S/E = LOW, No Key Press
				S/E = HIGH, Key Press
EN	3	Input	Controls internal microphone switch between the J_MIC and MIC pins	EN = LOW, Switch Open
				EN = HIGH, Switch Closed
J_DET	10	Input	Input from a pin of the audio jack socket tied to a mechanical switch that typically closes whenever an audio jack is inserted into that socket	J_DET = HIGH, Unplugged
				J_DET = LOW, Plugged
MIC	7	Switch	Microphone switch path that goes to the CODEC microphone amplifier input	EN = LOW, Switch Open
				EN = HIGH, Switch Closed
J_MIC	8	Switch	Microphone switch path that connects to the microphone and SEND/END key audio jack pole	EN = LOW, Switch Open
				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 through 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.

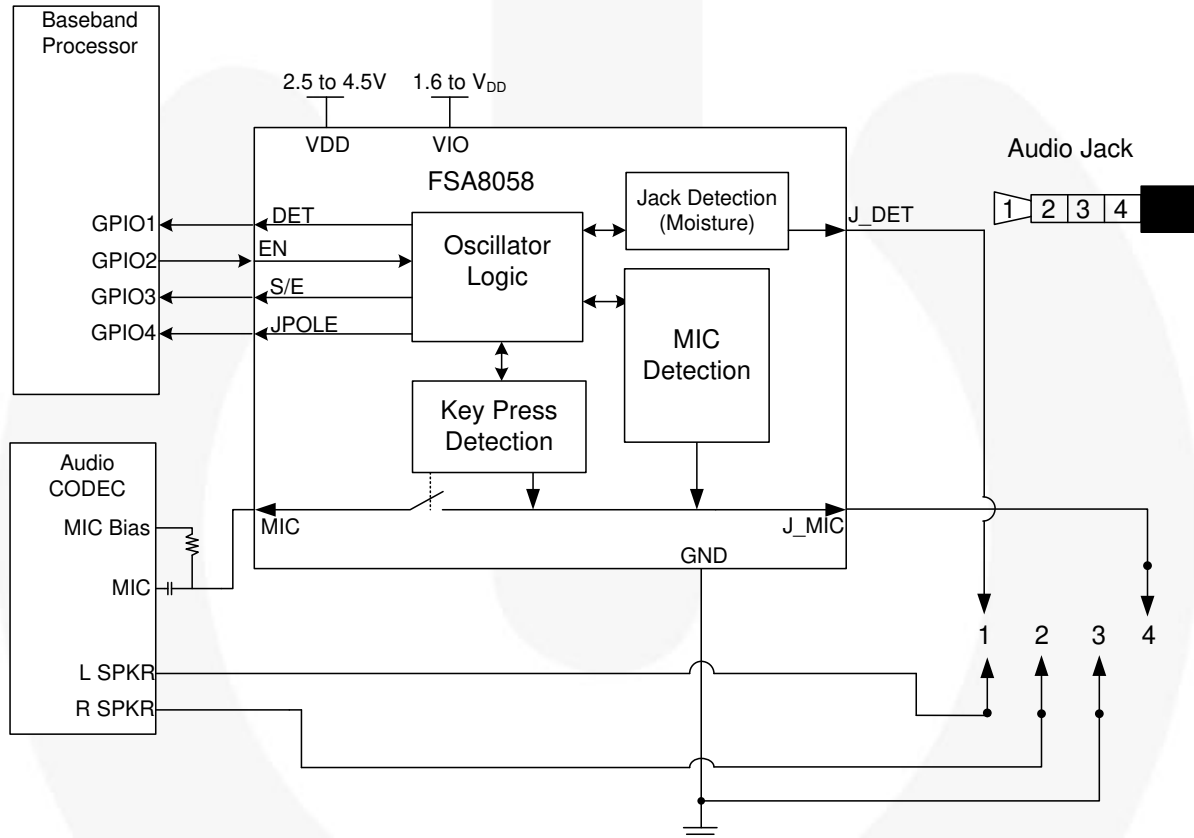


Figure 3. Typical Application Diagram

## 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	
$V_{SW}$	Switch I/O Voltage for "S" Switch, 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	15.0		kV
		Contact	8.0		
	JEDEC JESD22-A114, Human Body Model	All Pins	7.5		
		J_DET, J_MIC, $V_{DD}$ , $V_{IO}$	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	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)	Condition	$T_A = -40$ to $+85^\circ\text{C}$			Unit
				Min.	Typ.	Max.	
<b>MIC Switch</b>							
$R_{ON}$	MIC Switch On Resistance	2.8	$I_{OUT} = 30\text{ mA}$ , $V_{IN} = 2.2\text{ V}$		0.85	2.00	$\Omega$
		3.0			0.70	2.00	
		3.3			0.50	2.00	
		3.8			0.40	2.00	
$R_{FLAT(ON)}$	On Resistance Flatness	2.8	$I_{OUT} = 30\text{ mA}$ , $V_{IN} = 1.6$ to $2.8\text{ V}$		0.45	1.50	$\Omega$
		3.0			0.40	1.50	
		3.3			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
$C_{ON}$	MIC and J_MIC Switch ON Capacitance	3.8	$f = 1\text{ MHz}$		60		pF
$C_{OFF}$	MIC and J_MIC Switch OFF Capacitance	3.8	$f = 1\text{ MHz}$		35		pF
<b>J_MIC</b>							
$J\_MIC_{AudioV}$	Audio Voltage Range on J_MIC Pin	2.5 to 4.5	DET = LOW	0		3	V
$J\_MIC_{Audiof}$	Audio Frequency on J_MIC Pin	2.5 to 4.5	DET = LOW	20		20000	Hz
$J\_MIC_{RGND2}$	Detection Resistance to Ground			1250			$\Omega$
$J\_MIC_{HYS}$	Hysteresis of J_MIC				60		mV
$J\_MIC_{VIH}$	Input High Voltage			0.3			V
$J\_MIC_{VIL}$	Input Low Voltage			-0.5		1.0	V
<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		$0.4 \times V_{DD}$	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		$I_{OL} = +100\ \mu\text{A}$			$0.2 \times V_{IO}$	

Continued on the following page...

## DC Electrical Characteristics

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

Symbol	Parameter	$V_{DD}$ (V)	Condition	$T_A = -40$ to $+85^\circ\text{C}$			Unit
				Min.	Typ.	Max.	
<b>Comparator</b>							
$V_{COMP\_S/E}$	Comparator Threshold for SEND / END Sensing	2.8 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 $V_{IN} = 4.3$ V			1	$\mu\text{A}$
$I_{IN}$	Input Leakage Current	0	Inputs $V_{IN} = 4.3$ 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)		1.5	3.0	$\mu\text{A}$
$I_{CC\_SLWA}$	Battery Supply Sleep Mode Current with Accessory Attached	2.5 to 4.4	Active Current (EN = LOW and/or DET = HIGH)		20	25	$\mu\text{A}$

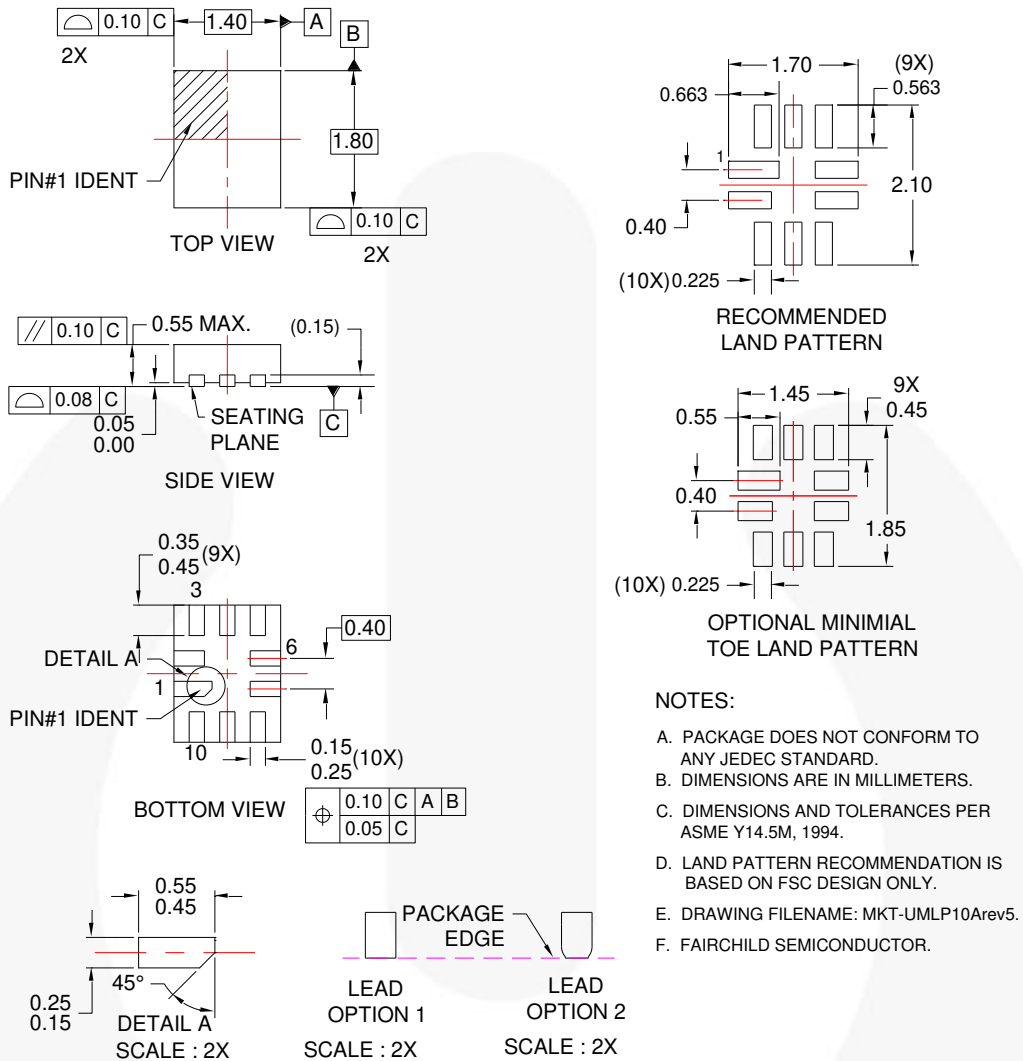
## AC Electrical Characteristics

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

Symbol	Parameter	$V_{DD}$ (V)	Conditions	Typical	Unit
<b>MIC Switch</b>					
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	%
$O_{IRR}$	Off Isolation	3.8	$f = 20$ kHz, $R_S = 32 \Omega$ , $C_L = 0$ pF, $R_T = 32 \Omega$	-85	dB
<b>Parallel I/O</b>					
$t_R, t_F$	Output Edge Rates (DET, S/E)	3.8	$C_L = 5$ pF, 20% to 80%, $-40^\circ\text{C}$ to $85^\circ\text{C}$	20	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		100	ms
$t_{DET\_REM}$	Debounce Time after J_DET Changes State from LOW to HIGH	2.5 to 4.5		1	ms
$t_{KBK}$	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 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
e	Lead Pitch	0.4
D	Body Length (Y)	1.8
E	Body Width (X)	1.4

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