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# FSA8009

## Audio Jack Send / End Detection with MIC / Video Switch

### Features

Detection	Accessory Plug-In 3- or 4-Pole Audio Jack Send / End Key Pressed
Switch Type	Microphone & Video
V <sub>DD</sub>	2.5 to 4.3 V
THD (MIC)	0.01% Typical
ESD (Air Gap)	16 kV
Operating Temperature	-40°C to 85°C
Package	10-Lead UMLP 1.4x1.8x0.5 mm, 0.4 mm Pitch
Top Mark	KP
Ordering Information	FSA8009UMX

### Description

The FSA8009 is an audio jack microphone / video switch for 3- or 4-pole accessories with send / end (S/E) detection. In addition to detection, the FSA8009 features an integrated microphone / video switch that allows the processor to configure the audio jack. 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.

- Determines When Send / End Button Key is Pressed
- Integrates a MIC / Video Switch for 4-Pole Configuration
- Reduces Pop / Click Caused by Microphone Bias

### Related Resources

- For samples and questions, please contact: [Analog.Switch@fairchildsemi.com](mailto:Analog.Switch@fairchildsemi.com).
- FSA8009 Demonstration Board

### Applications

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

### Typical Application

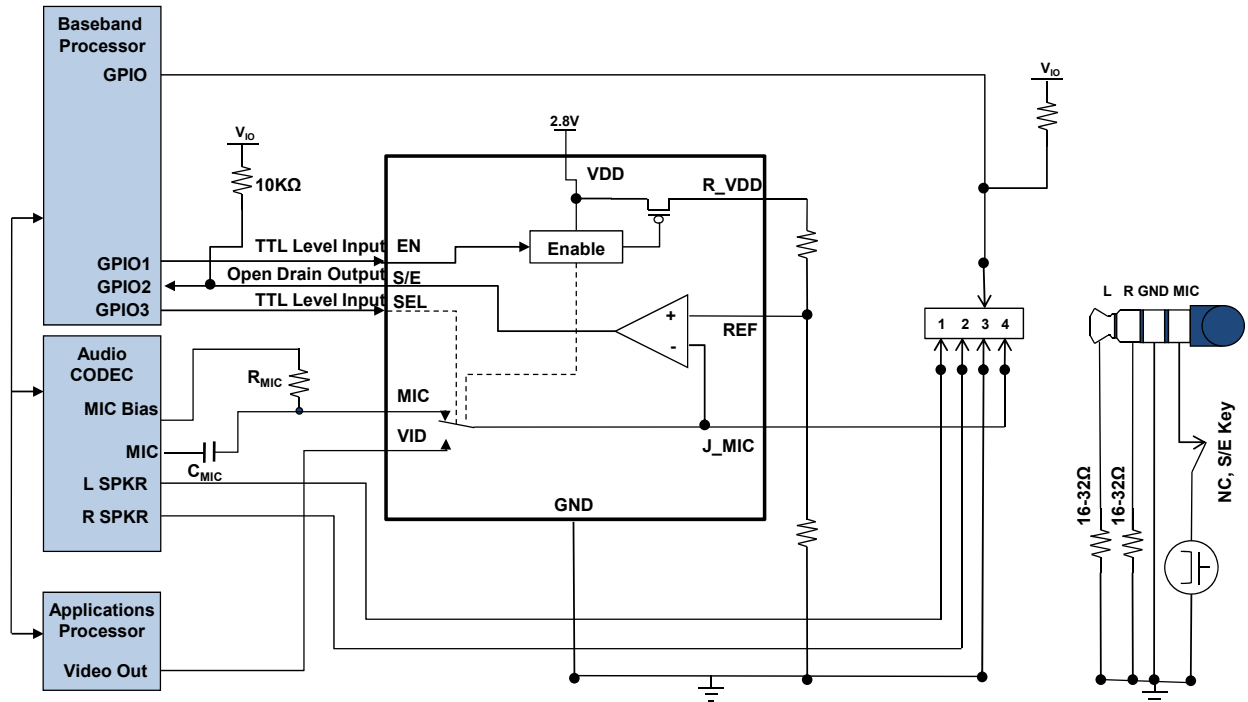


Figure 1. Mobile Phone Example

## Pin Descriptions

Name	Pin #	Type	Description	
R_VDD	1	Output	Optional pull-up voltage, with a resistor divider, sets the reference voltage on the REF pin	
EN	2	Input	0	Device inactive <sup>(1)</sup>
			1	Device active <sup>(1)</sup>
SEL	3	Input	0	VID = J_MIC <sup>(1)</sup>
			1	MIC = J_MIC <sup>(1)</sup>
S/E	4	Output	0	Press <sup>(1)</sup>
			1	No key press <sup>(1)</sup>
VID	6	Switch	Video switch path; connects between video source and audio jack microphone pin	
VDD	5	Power	Supply voltage	
MIC	7	Switch	Microphone switch path that goes to the CODEC microphone amplifier input	
J_MIC	8	Switch	Microphone switch path that connects to the microphone, SEND/END key, and jack pole video	
REF	10	Input	Reference voltage used to detect a send / end key press, through a resistor divider off R_VDD or external voltage reference	
GND	9	Ground	Ground for both the audio jack and the PCB	

**Note:**

1. 0 = V<sub>OL</sub> or V<sub>IL</sub>; 1 = V<sub>OH</sub> or V<sub>IH</sub>.

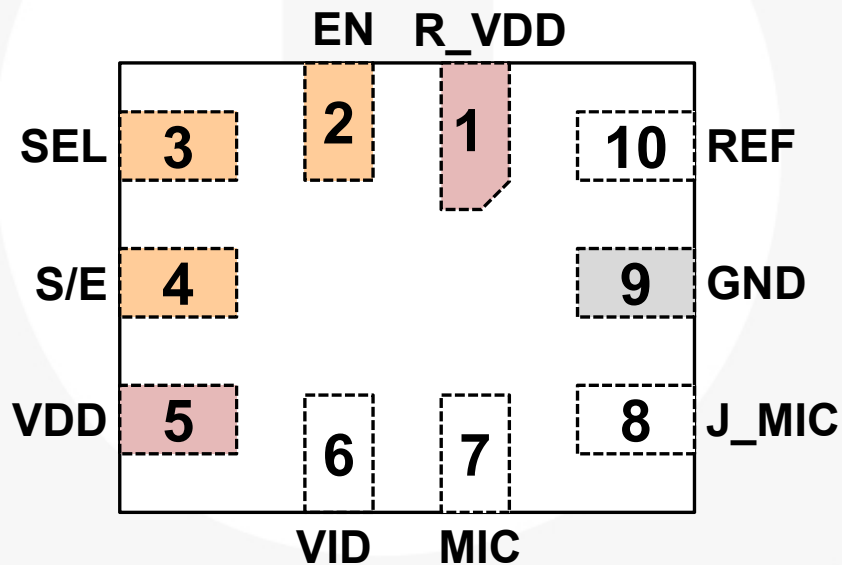


Figure 2. UMLP Pin Assignment (Through View)

Table 1. Device Configuration in Reset and Active States

EN	SEL	MIC	VID	R_VDD	S/E
0	X	3-State	3-State	GND	HIGH
1	1	J_MIC	Open	VDD	Active
1	0	Open	J_MIC	GND	LOW

## 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.	Units
$V_{DD}$	Supply Voltage from Battery	-0.5	5.5	V
$V_{SW}$	Switch I/O Voltage	-0.5	$V_{DD}+0.5$	V
$I_{IK}$	Input Clamp Diode Current <sup>(2)</sup>	-50		mA
$I_{SW}$	Switch I/O Current (Continuous) <sup>(2)</sup>		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	Air Gap	16	kV
		Contact	10	
	Human Body Model, JEDEC JESD22-A114	All other Pins	6	
		$J_{DET}$ , $J_{MIC}$ , $V_{DD}$ , $V_{IO}$ , GND	8	
	Charged Device Model, JEDEC JESD22-C101	All Pins	2	

### 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.	Units
$V_{DD}$	Battery Supply Voltage	2.5	4.3	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.

### MIC Switch

Symbol	Parameter	$V_{DD}$ (V)	Conditions	$T_A = -40$ to $+85^\circ\text{C}$			Units
				Min.	Typ.	Max.	
$R_{ON}$	MIC Switch On Resistance	2.8	$I_{OUT} = 24\text{ mA}, V_{IN} = 2.2\text{ V}$		2.0	4.0	$\Omega$
		3.0			1.5	3.5	
		3.3			1.2	3.0	
		3.8			1.0	2.5	
$R_{FLAT(ON)}$	On Resistance Flatness	2.8	$I_{OUT} = 24\text{ mA}, V_{IN} = 1\text{ V to }V_{DD}$		0.7	1.5	$\Omega$
		3.0			0.6	1.4	
		3.3			0.5	1.3	
		3.8			0.5	1.2	
$V_{IN}$	Switch Input Voltage Range	2.5 to 4.3		0		$V_{DD}$	V
$C_{ON}$	MIC and J_MIC Switch ON Capacitance	2.8	$f = 1\text{ MHz}$		15		pF
$C_{OFF}$	MIC and J_MIC Switch OFF Capacitance	2.8	$f = 1\text{ MHz}$		8		pF

### Video Switch Characteristics

Symbol	Parameter	$V_{DD}$ (V)	Conditions	$T_A = -40$ to $+85^\circ\text{C}$			Unit
				Min.	Typ.	Max.	
$R_{ON}$	MIC Switch On Resistance	2.8	$I_{OUT} = 24\text{ mA}, V_{IN} = 0.5\text{ V}$		1.0	1.5	$\Omega$
		3.0			0.9	1.4	
		3.3			0.8	1.3	
		3.8			0.7	1.2	
$R_{FLAT(ON)}$	On Resistance Flatness	2.8	$I_{OUT} = 24\text{ mA}, V_{IN} = 0\text{ V to }1.2\text{ V}$		0.4	0.60	$\Omega$
		3.0			0.3	0.55	
		3.3			0.2	0.50	
		3.8			0.15	0.45	
$V_{IN}$	Switch Input Voltage Range	2.5 to 4.3		0		1.5	V
$C_{ON}$	VID Switch ON Capacitance	2.8	$f = 1\text{ MHz}$		40		pF
$C_{OFF}$	VID Switch OFF Capacitance	2.8	$f = 1\text{ MHz}$		10		pF

### Parallel I/O

Symbol	Parameter	$T_A = -40$ to $+85^\circ\text{C}$			Unit
		Min.	Typ.	Max.	
$V_{IH}$	Input High Voltage (EN, SEL)	$0.44 \times V_{DD}$		$V_{DD}$	V
$V_{IL}$	Input Low Voltage (EN, SEL)	GND		$0.15 \times V_{DD}$	V
$PUR_{S/E}$	Pull-Up Resistor on S/E	2		110	K $\Omega$
$V_{OL}$	Output Low Voltage (S/E) ( $V_{PUR}$ = Voltage of Pull-Up Resistor)			$0.2 \times V_{PUR}$	V

**DC Electrical Characteristics** (Continued)All typical values are at  $T_A=25^\circ\text{C}$  unless otherwise specified.**Comparator NC Switch**

Symbol	Parameter	$V_{DD}$ (V)	Conditions	$T_A = -40$ to $+85^\circ\text{C}$			Unit
				Min.	Typ.	Max.	
$V_{REF}$	Input Voltage on REF Pin			1		$V_{DD} - 0.075$	V
$COM_{HYS}$	Hysteresis of Comparator "-" Terminal				50		mV

**Current**

Symbol	Parameter	$V_{DD}$ (V)	Conditions	$T_A = -40$ to $+85^\circ\text{C}$			Unit
				Min.	Typ.	Max.	
$I_{OFF}$	Off-State Leakage Current	4.3	J_MIC = 1 V, 4.3 V MIC or VID = 4.3 V, 1 V	-15		15	nA
$I_{IN}$	Input Leakage Current	0 to 4.3	Inputs 0 to 4.3 V			1	$\mu\text{A}$
$I_{CC-EN}$	Low-Power Mode	2.5 to 4.3	EN = LOW		10		nA
$I_{CC-VID}$	Current during Video Mode	2.5 to 4.3	Active Current (EN = HIGH, SEL = LOW)		10		nA
$I_{CC-MIC}$	Current during Microphone Mode	2.5 to 4.3	Active Current (EN = HIGH, SEL = HIGH)		20		$\mu\text{A}$

## AC Electrical Characteristics

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

### MIC Switch

Symbol	Parameter	$V_{DD}$ (V)	Conditions	$T_A = -40\text{ to }+85^\circ\text{C}$			Unit
				Min.	Typ.	Max.	
THD	Total Harmonic Distortion	2.8	$R_T = 600\ \Omega$ , $V_{SW} = 0.5\ V_{PP}$ , $f = 20\ \text{Hz to } 20\ \text{kHz}$ , $V_{IN} = 2.2\ \text{V}$		.003		%
$O_{IRR}$	Off Isolation	2.8	$f = 20\ \text{kHz}$ , $R_S=32\ \Omega$ , $C_L=0\ \text{pF}$ , $R_T=32\ \Omega$		-100		dB
$X_{TALK}$	Crosstalk from MIC to VID	2.8	$f = 100\ \text{MHz}$ , $R_L=100\ \Omega$		-67		dB

### Video Switch Characteristics

Symbol	Parameter	$V_{DD}$ (V)	Conditions	$T_A = -40\text{ to }+85^\circ\text{C}$			Unit
				Min.	Typ.	Max.	
$D_G$	Differential Gain	2.8	$R_L = 150\ \Omega$ , $f = 3.58\ \text{MHz}$		.09		%
$D_P$	Differential Phase	2.8	$R_L = 150\ \Omega$ , $f = 3.58\ \text{MHz}$		.13		°
$O_{IRR}$	Off Isolation	2.8	$f=10\ \text{MHz}$ , $R_L=150\ \Omega$ ,		-45		dB
$X_{TALK}$	Crosstalk from VID to MIC	2.8	$f=10\ \text{MHz}$ , $R_{IN} = 10\ \Omega$ , $C_L=0\ \text{pF}$ , $R_L=150\ \Omega$		-65		dB

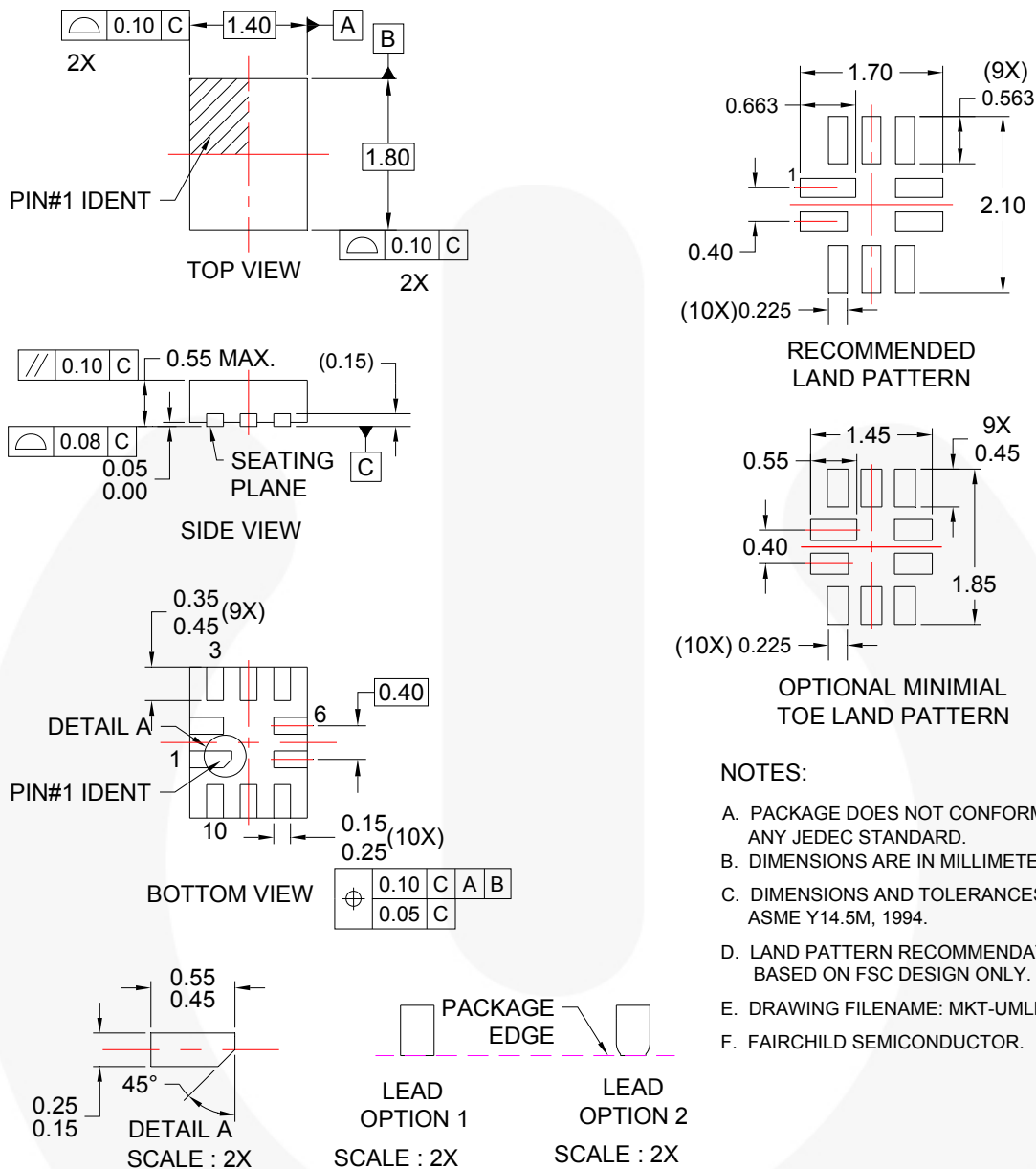
### Parallel I/O

Symbol	Parameter	$V_{DD}$ (V)	Conditions	$T_A = -40\text{ to }+85^\circ\text{C}$			Unit
				Min.	Typ.	Max.	
$t_{BBM}$	Break-Before-Make Time	2.5 to 4.3			120		ns
$t_{EN}$	Enable or Disable Time	2.5 to 4.3	EN LOW→ HIGH or EN HIGH→LOW		15		$\mu\text{s}$
$t_{SEL-COM-ON}$	Select to Comparator On	2.5 to 4.3	SEL LOW→ HIGH to Comparator ON		10		$\mu\text{s}$
$t_{SEL-COM-OFF}$	Select to Comparator Off	2.5 to 4.3	SEL HIGH→LOW to Comparator OFF		20		ns
$t_{ON}$	Switch Turn-On Time	2.5 to 4.3			40		ns
$t_{OFF}$	Switch Turn-Off Time	2.5 to 4.3			15		ns
$t_{J\_MIC-S/E}$	Propagation Delay from Comparator Trigger to S/E Output	2.5 to 4.3	$J\_MIC > REF$ from LOW→HIGH $J\_MIC < REF$ from HIGH→LOW		10		$\mu\text{s}$

### Power

Symbol	Parameter	$V_{DD}$ (V)	Conditions	$T_A = -40\text{ to }+85^\circ\text{C}$			Unit
				Min.	Typ.	Max.	
PSRR	Power Supply Rejection Ratio	2.8	Power Supply Noise $300\ \text{mV}_{PP}$ , Measured 10/90%, $f=217\ \text{Hz}$		-100		dB

### Physical Dimensions



**Figure 3. 10-Lead UMLP Package Drawing**

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### Ordering Information

Part Number	Operating Temperature Range	Top Mark	Package
FSA8009UMX	-40 to +85°C	KP	10-Lead 1.4 x 1.8 x 0.55 mm, 0.4 mm Pitch, Ultrathin Molded Leadless Package (UMLP)



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