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March 2013

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_{DD}	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

Applications

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

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.*
- *FSA8009 Demonstration Board*

Typical Application

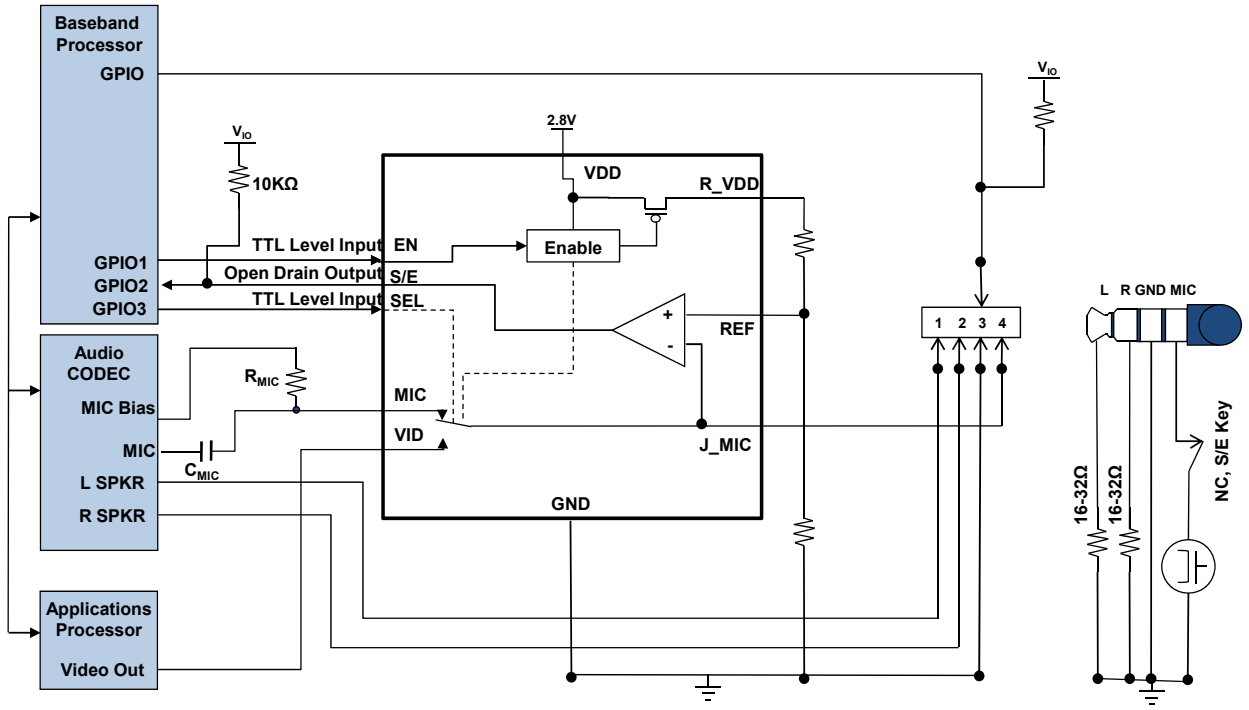

Figure 1. Mobile Phone Example

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	Device enable, low-power mode	0	Device inactive(1)
				1	Device active(1)
SEL	3	Input	MIC / VID switch select pin	0	VID = J_MIC(1)
				1	MIC = J_MIC(1)
S/E	4	Output	Indicates state of send /end key press, open-drain output requires pull-up resistor	0	Press(1)
				1	No key press(1)
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_{OL} or V_{IL}; 1 = V_{OH} or V_{IH}.

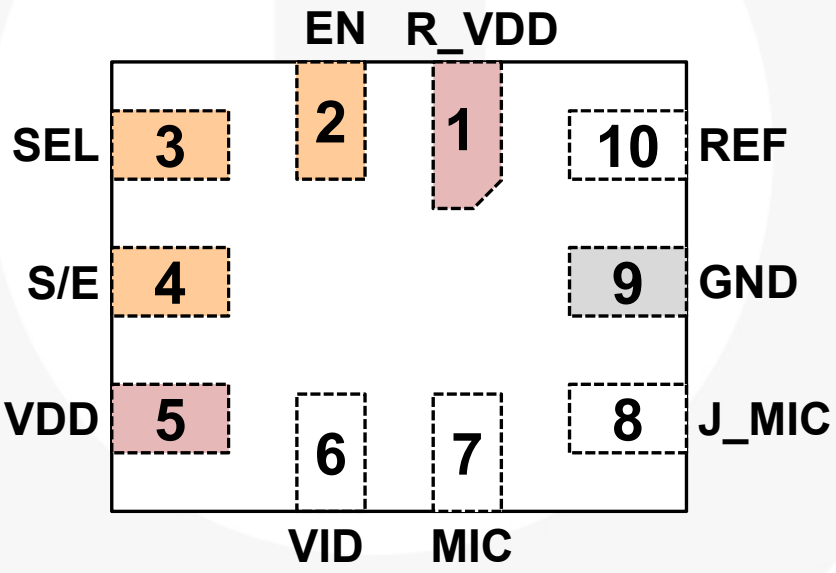

Figure 2. UMLP Pin Assignment (Through View)

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(2)		-50		mA
I_{SW}	Switch I/O Current (Continuous)(2)			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:

2. 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	ºC

DC Electrical Characteristics

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

MIC Switch

Symbol	Parameter	V_{DD} (V)	Conditions	T_A = -40 to +85°C			Units
				Min.	Typ.	Max.	
R_{ON}	MIC Switch On Resistance	2.8	I_{OUT} = 24 mA, V_{IN} = 2.2 V		2.0	4.0	Ω
		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 mA, V_{IN} = 1 V to V_{DD}		0.7	1.5	Ω
		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 MHz		15		pF
C_{OFF}	MIC and J_MIC Switch OFF Capacitance	2.8	f = 1 MHz		8		pF

Video Switch Characteristics

Symbol	Parameter	V_{DD} (V)	Conditions	T_A = -40 to +85°C			Unit
				Min.	Typ.	Max.	
R_{ON}	MIC Switch On Resistance	2.8	I_{OUT} = 24 mA, V_{IN} = 0.5 V		1.0	1.5	Ω
		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 mA, V_{IN} = 0 V to 1.2 V		0.4	0.60	Ω
		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 MHz		40		pF
C_{OFF}	VID Switch OFF Capacitance	2.8	f = 1 MHz		10		pF

Parallel I/O

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

DC Electrical Characteristics (Continued)

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

Comparator NC Switch

Symbol	Parameter	V_{DD} (V)	Conditions	T_A = -40 to +85°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°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	µA
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		µA

AC Electrical Characteristics

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

MIC Switch

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

Video Switch Characteristics

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

Parallel I/O

Symbol	Parameter	V_{DD} (V)	Conditions	T_A = -40 to +85°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		µs
$t_{SEL-COM-ON}$	Select to Comparator On	2.5 to 4.3	SEL LOW→ HIGH to Comparator ON		10		µs
$t_{SEL-COM-OFF}$	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		µs

Power

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

Physical Dimensions

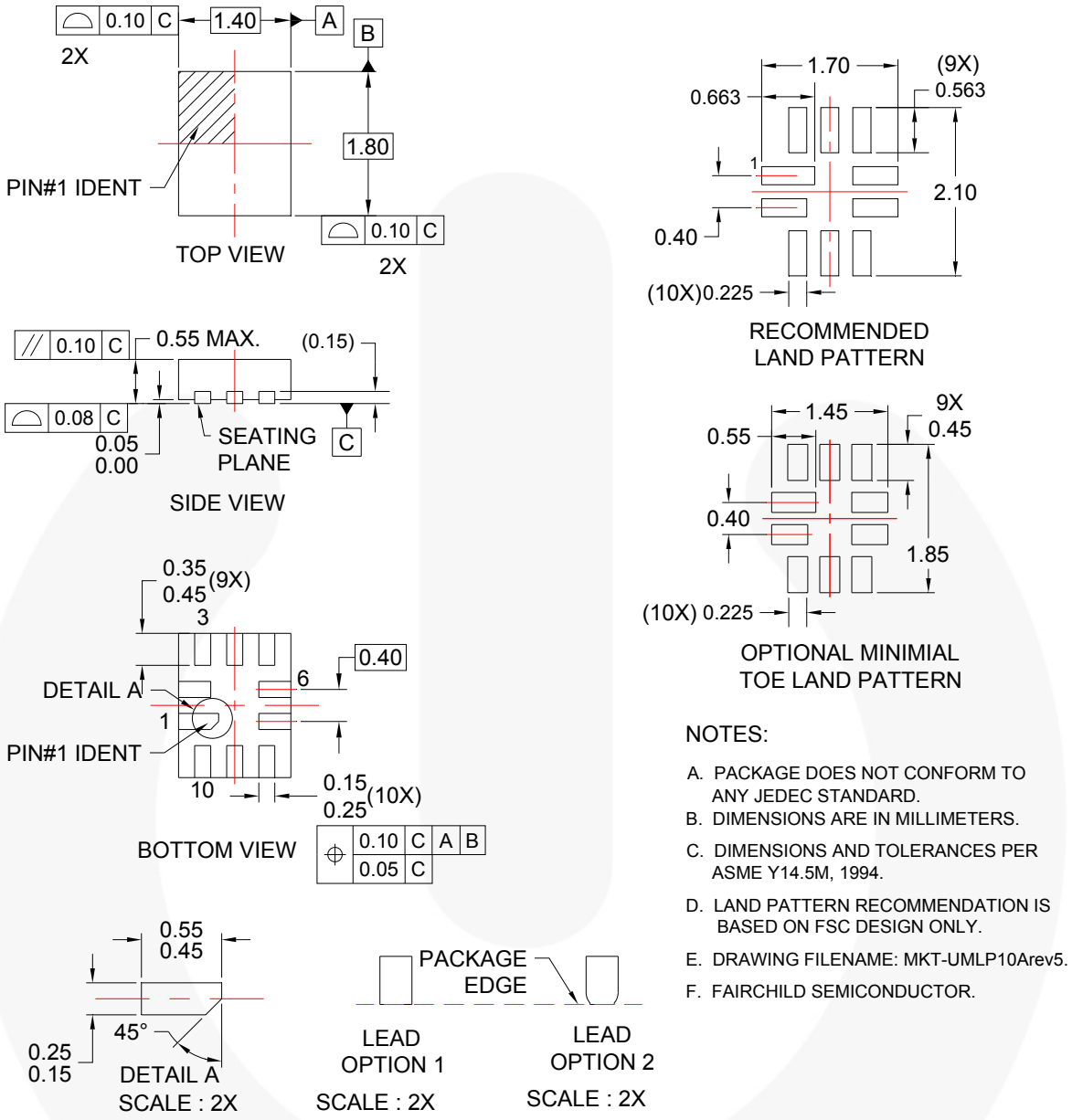

Figure 3. 10-Lead UMLP Package Drawing

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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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