March 2013

FSA8008/FSA8008A
Audio Jack Detection and Configuration Switch

Features

Detection		Accessory Plug-In 3- or 4-Pole Audio Jack Send/End Key Pressed
Functionality	FSA8008	
	FSA8008A	Decreased Timing for Sensitive Send/End Keys
Switch Type		MIC
V_{DD}		2.5 to 4.4 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 1.4x1.8x0.5 mm, 0.4 mm Pitch
Top Mark	FSA8008	KC
	FSA8008A	KD
Ordering Information		FSA8008UMX
		FSA8008AUMX

Applications

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

Description

The FSA8008/FSA8008A is an audio jack detector and switch for 3- or 4-pole accessories. In addition to detection, the FSA8008/A features an integrated MIC 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 3- or 4-Pole Audio Jacks
- Removes Audio Jack Pop-n-Click Caused by MIC Bias
- Detects Audio Jack Accessories:
  - Standard Headphones
  - Headsets with MIC
  - Send / End Button Presses
- Integrates a MIC Switch for 4-Pole Configuration

Related Resources

- *FSA8008/FSA8008A Demonstration Board*
- *For samples and questions, please contact: Analog.Switch@fairchildsemi.com.*

Typical Application

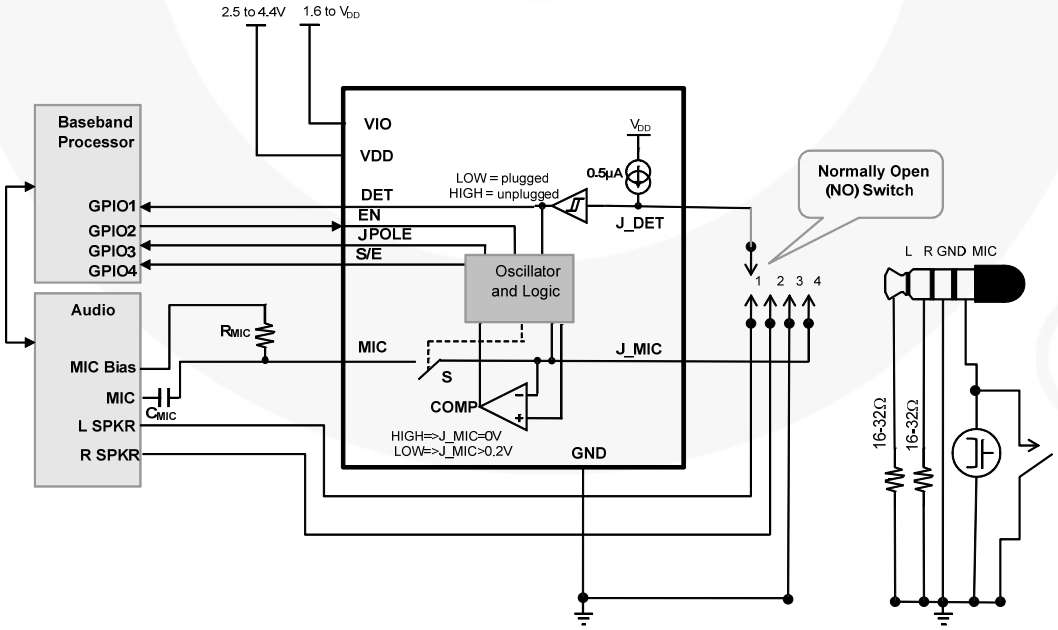

Figure 1. Mobile Phone Example

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Pin Configuration

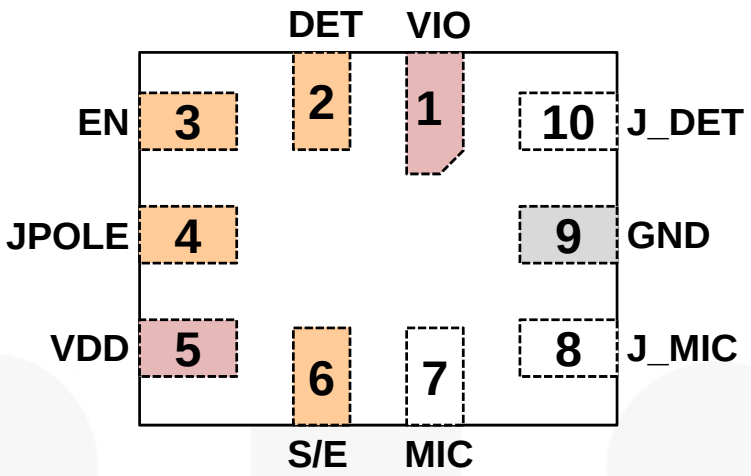

Figure 2. 10-Lead UMLP Pin Assignment (Through View)

Pin Descriptions

Name	Pin #	Type	Description	Function	
DET	2	Output	Indicates if an accessory is plugged into the audio jack, as detected on the J_DET pin	0	Plugged
				1	Unplugged
JPOLE	4	Output	Indicates if an accessory plugged into the audio jack is 3 pole or 4 pole	0	4-pole jack
				1	3-pole jack
S/E	6	Output	Indicates state of SEND/END for a 4-pole accessory when a key has been pressed	0	No key press
				1	Key press
EN	3	Input	Controls internal microphone switch between the J_MIC and MIC pins	0	MIC / J_MIC switch open
				1	MIC / J_MIC 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	0	Plugged
				1	Unplugged
MIC	7	Switch	Microphone switch path that goes to the microphone preamplifier	*See EN pin*	
J_MIC	8	Switch	Microphone switch path that connects to the microphone and SEND/END key audio jack pole		
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		

Note:
1. 0 = V_{OL} or V_{IL}; 1 = V_{OH} or V_{IH}

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Functional Diagram

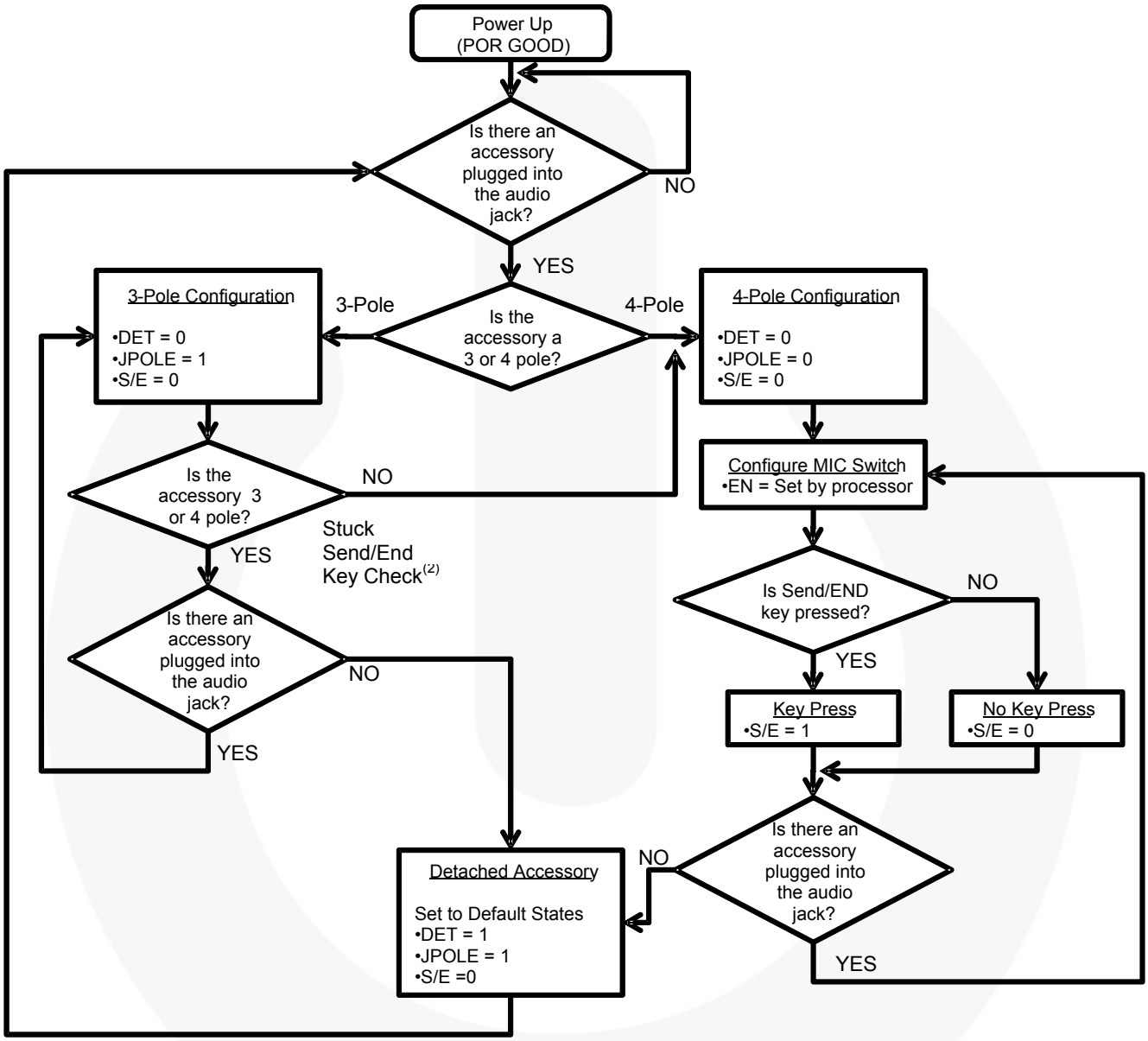

Figure 3. Functional Flow Diagram

Note:
2. FSA8008A stuck Send/End key function is only available if EN=H.

Table 1. FSA8008 vs. FSA8008A Stuck Send/End Key

EN	FSA8008	FSA8008A
H	Stuck Send / End Key Active	Stuck Send / End Key Active
L	Stuck Send / End Key Active	Stuck Send / End Key Disabled

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Table 2. States During Power Good and OFF

State Description	VDD	VIO	DET	EN	JPOLE	S/E	J-DET	MIC Switch
Active	1	1	Active					
OFF	0	0	1 (unplugged)	3-State	1 (3 Pole)	0 (No Press)	H (unplugged)	Open
	1	0						
	0	1						

Table 3. FSA8008 I/O States During Detection(3)

J_DET	J_MIC	EN	S/E		JPOLE		DET
			3 Pole	4 Pole	3 Pole	4 Pole	
0	1	1	0 (no press)	0 (no press)	0 (4 Pole)	0 (4 Pole)	0
0	0	0	0 (no press)	1 (press)	1 (3 Pole)	0 (4 Pole)	0
0	1	0	0 (no press)	0 (no press)	0 (4 Pole)(4)	0 (4 Pole)	0
0	0	1	0 (no press)	1 (press)	1 (3 Pole)	0 (4 Pole)	0
1	X	X	0 (no press)	0 (no press)	1 (3 Pole)	1 (3 Pole)	1

Notes:
3. State detected after initial plug-in.
4. Difference between the FSA8008 and the FSA8008A products.

Table 4. FSA8008A I/O States During Detection(5)

J_DET	J_MIC	EN	S/E		JPOLE		DET
			3 Pole	4 Pole	3 Pole	4 Pole	
0	1	1	0 (no press)	0 (no press)	0 (4 Pole)	0 (4 Pole)	0
0	0	0	0 (no press)	1 (press)	1 (3 Pole)	0 (4 Pole)	0
0	1	0	0 (no press)	0 (no press)	1 (3 Pole)(6)	0 (4 Pole)	0
0	0	1	0 (no press)	1 (press)	1 (3 Pole)	0 (4 Pole)	0
1	X	X	0 (no press)	0 (no press)	1 (3 Pole)	1 (3 Pole)	1

Notes:
5. State detected after initial plug-in.
6. Difference between the FSA8008 and the FSA8008A products.

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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} & 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	15.0		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		

Note:

8. 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	4.4	V
V_{IO}	Parallel I/O Supply Voltage	1.6	V_{DD}	V
T_A	Operating Temperature	-40	+85	ºC

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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	2.5	I_{OUT} = 30 mA, V_{IN} = 2.0 V		0.9	2.9	Ω
		2.8			0.8	2.5	
		3.8			0.6	2.0	
$R_{FLAT(ON)}$	On Resistance Flatness	2.5	I_{OUT} = 30 mA, V_{IN} = 1.6, 2.0, 2.5		1.50		
		2.8	I_{OUT} = 30 mA, V_{IN} = 1.6, 2.0, 2.8		0.70		
		3.8			0.25		
V_{IN}	Switch Input Voltage Range	2.5 to 4.4		0		V_{DD}	V
C_{ON}	MIC and J_MIC Switch ON Capacitance	3.8	f = 1 MHz		76		pF
C_{OFF}	MIC and J_MIC Switch OFF Capacitance	3.8	f = 1 MHz		24		pF

J_DET

Symbol	Parameter	V_{DD} (V)	Conditions	T_A = -40 to +85°C			Units
				Min.	Typ.	Max.	
J_DET_{AudioV}	Audio Voltage Range on J_DET Pin	2.5 to 4.4	DET = L	-1		1	V
J_DET_{Audiof}	Audio Frequency on J_DET Pin	2.5 to 4.4	DET = L	20		20000	Hz
J_DET_{RGND}	Detection Resistance to Ground	2.5 to 4.4	Audio Jack Inserted	0		500	KΩ
J_DET_{HYS}	Hysteresis of J_DET				100		mV

Parallel I/O

Symbol	Parameter	Conditions	T_A = -40 to +85°C			Units
			Min.	Typ.	Max.	
V_{IH}	Input High Voltage		0.7 x V_{IO}		V_{IO}	V
V_{IL}	Input Low Voltage				0.3 x V_{IO}	V
V_{OH}	Output High Voltage	I_{OH} = -100 µA	0.8 x V_{IO}			V
V_{OL}	Output Low Voltage	I_{OL} = +100 µA			0.2 x V_{IO}	V

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DC Electrical Characteristics (Continued)

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

Comparator

Symbol	Parameter	V_{DD} (V)	Conditions	T_A = -40 to +85°C			Units
				Min.	Typ.	Max.	
V_{COMP}	Comparator Threshold for SEND/END Sensing	2.5-3.8	J_DET, EN = L		200		mV

Current

Symbol	Parameter	V_{DD} (V)	Conditions	T_A = -40 to +85°C			Units
				Min.	Typ.	Max.	
I_{OFF}	Power Off Leakage Current Through Switch	0	MIC and J_MIC Ports V_{IN} = 4.4 V			1.5	µA
I_{IN}	Input Leakage Current	0 to 4.4	Inputs 0 = 4.4 V			1	µA
$I_{CC-SLNA}$	Battery Supply Sleep Mode Current No Accessory Attached	2.5 to 4.4	Static Current During Sleep Mode (EN = L)		1	3	µA
$I_{CC-SLWA}$	Battery Supply Sleep Mode Current with Accessory Attached	2.5 to 4.4	Active Current (EN = L and/or DET = H)		15	25	µA

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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	3.8	R_T = 600 Ω, V_{SW} = 0.5 V_{PP}, f = 20 Hz to 20 kHz, V_{IN} = 2.0 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

Symbol	Parameter	V_{DD} (V)	Conditions	T_A = -40 to +85°C			Unit
				Min.	Typ.	Max.	
t_R, t_F	Output Edge Rates (DET, S/E, JPOLE)	2.5	C_L = 5 pF, 20% to 80%		19		ns
		3.8			15		
t_{POLL}	On Time of MIC Switch for Sensing SEND/END Button Press Oscillator Stable Time	2.5 to 4.4	FSA8008		15		ms
			FSA8008A		1		
t_{PER}	Period of MIC Switching Time for Sensing SEND/END Button Press	2.5 to 4.4	FSA8008		140		ms
			FSA8008A		10		
t_{DET-IN}	Debounce Time after J-DET Changes State from High to Low	2.5 to 4.4			422		ms
t_{DET_REM}	Debounce Time after J_DET Changes State from Low to High	2.5 to 4.4			30		µs
t_{DET}	Detection Timeout for Sensing 3-Pole or 4-Pole Audio Jack Plugged In	2.5 to 4.4	FSA8008		70		ms
			FSA8008A		4.5		
t_{KBK}	Debounce Time for Sensing SEND/END Key Press / Release	2.5 to 4.4			27		ms

Power

Symbol	Parameter	V_{DD} (V)	Conditions	T_A = -40 to +85°C			Unit
				Min.	Typ.	Max.	
PSRR	Power Supply Rejection Ratio	3.8	Power Supply Noise 300 mV_{PP}, Measured 10/90%, f = 217 Hz		-90		dB

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Physical Dimensions

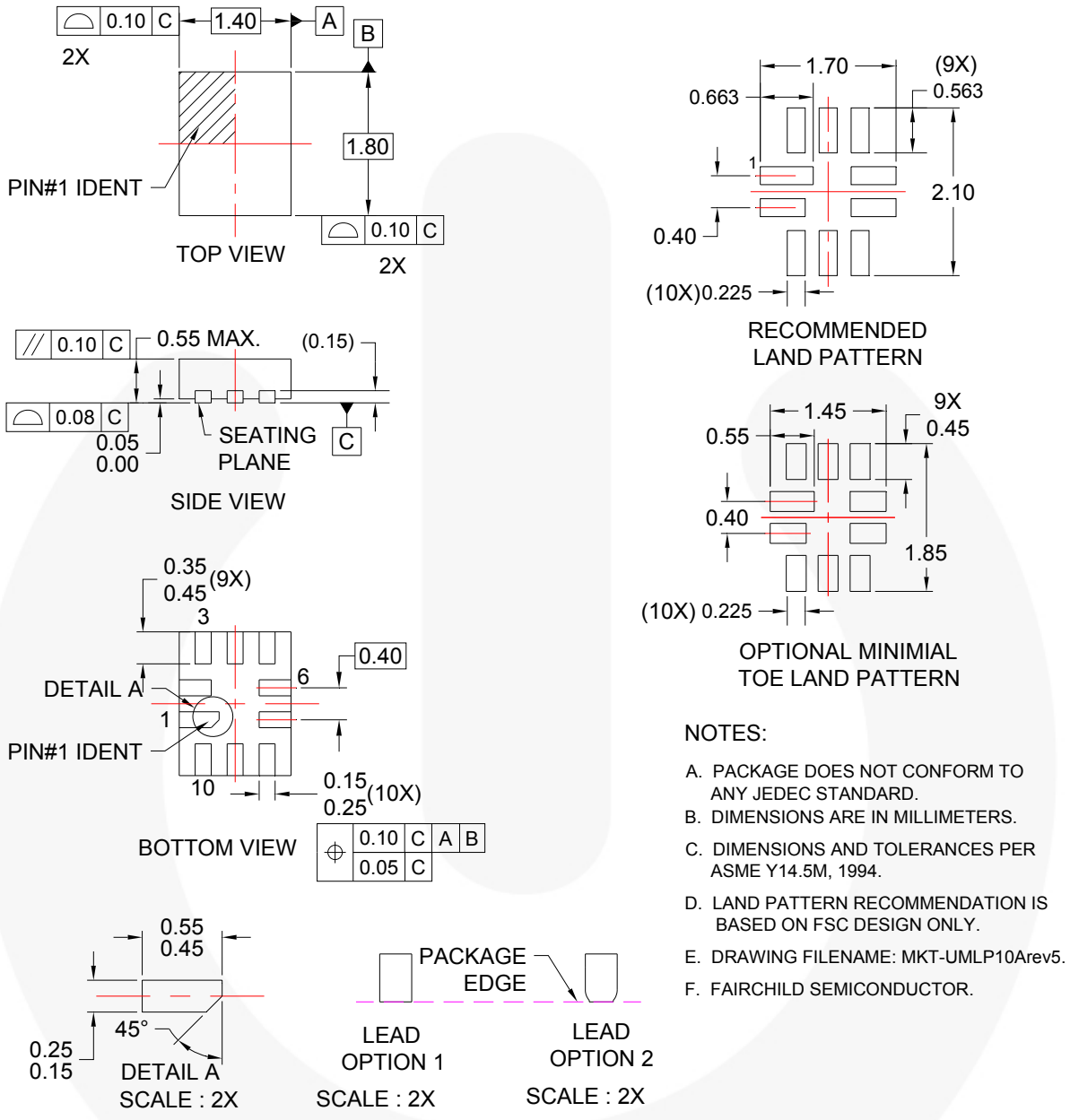

Figure 4. 10-Lead UMLP Package Drawing

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Ordering Information

Part Number	Operating Temperature Range	Top Mark	Package
FSA8008UMX	-40 to +85°C	KD	10-Lead, 1.4 x 1.8 x 0.55 mm, 0.4 mm Pitch, Ultrathin Molded Leadless Package (UMLP)
FSA8008AUMX		KC	

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