September 2014

FSA8028
Audio Jack Detection and Configuration Switch

Features

Detection	Accessory Plug-In 3- or 4-Pole Audio Jack Send/End Key Pressed
Functionality	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

Description

The FSA8028 is an audio jack detector and switch for 3- or 4-pole accessories. In addition to detection, the FSA8028 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

Applications

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

Ordering Information

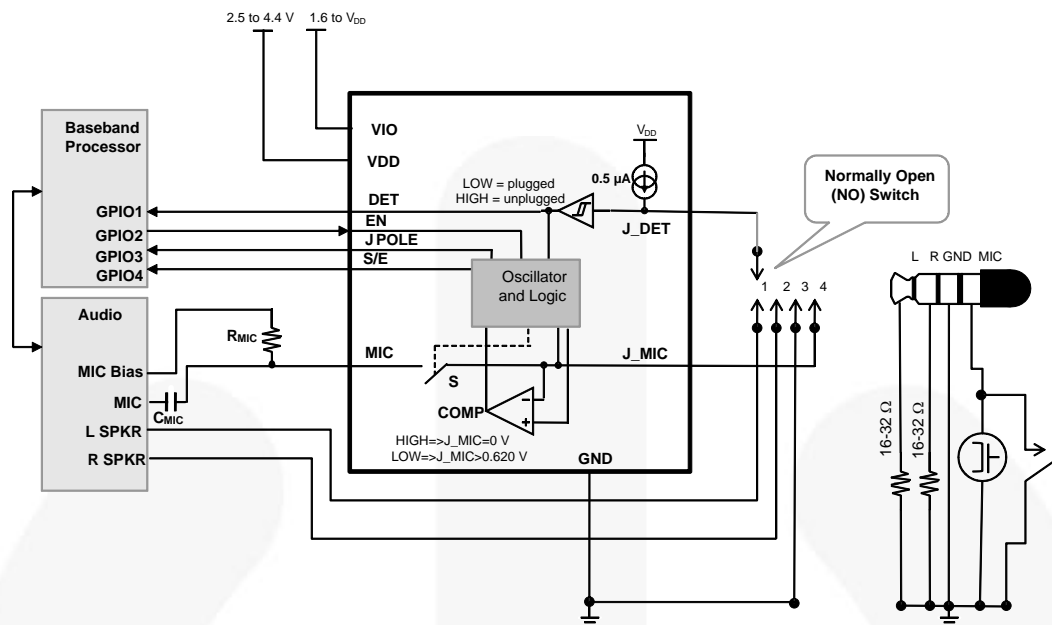| Part Number	Operating Temperature Range	Top Mark	Package
FSA8028UMX	-40 to +85°C	KZ	10-Lead, 1.4 x 1.8 x 0.55 mm, 0.4 mm Pitch, Ultrathin Molded Leadless Package (UMLP)

Typical Application
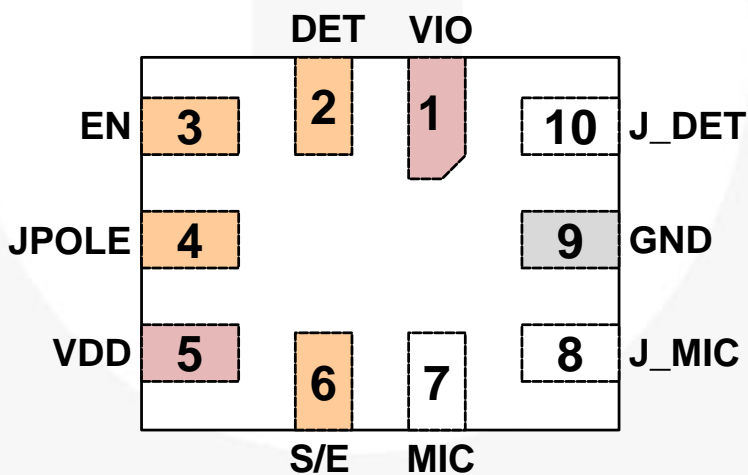

Figure 1.   Mobile Phone Example

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}

Functional Diagram

```
                          ┌─────────────────┐
                          │   Power Up      │
                          │  (POR GOOD)     │
                          └─────────────────┘
                                  │
                          ┌───────────────┐
                          │ Is there an   │
                          │ accessory     │  NO
                          │ plugged into  │────►
                          │ the audio     │
                          │ jack?         │
                          └───────────────┘
                              │ YES
```

Is there an accessory plugged into the audio jack? — NO

3-Pole Configuration
- DET = 0
- JPOLE = 1
- S/E = 0

Is the accessory a 3 or 4 pole? — 3-Pole / 4-Pole

4-Pole Configuration
- DET = 0
- JPOLE = 0
- S/E = 0

Is the accessory 3 or 4 pole? — NO

Stuck Send/End Key Check[2]

Configure MIC Switch
- EN = Set by processor

Is there an accessory plugged into the audio jack? — NO / YES

Is Send/END key pressed? — NO / YES

Key Press
- S/E = 1

No Key Press
- S/E = 0

Detached Accessory

Set to Default States
- DET = 1
- JPOLE = 1
- S/E = 0

Is there an accessory plugged into the audio jack? — NO / YES

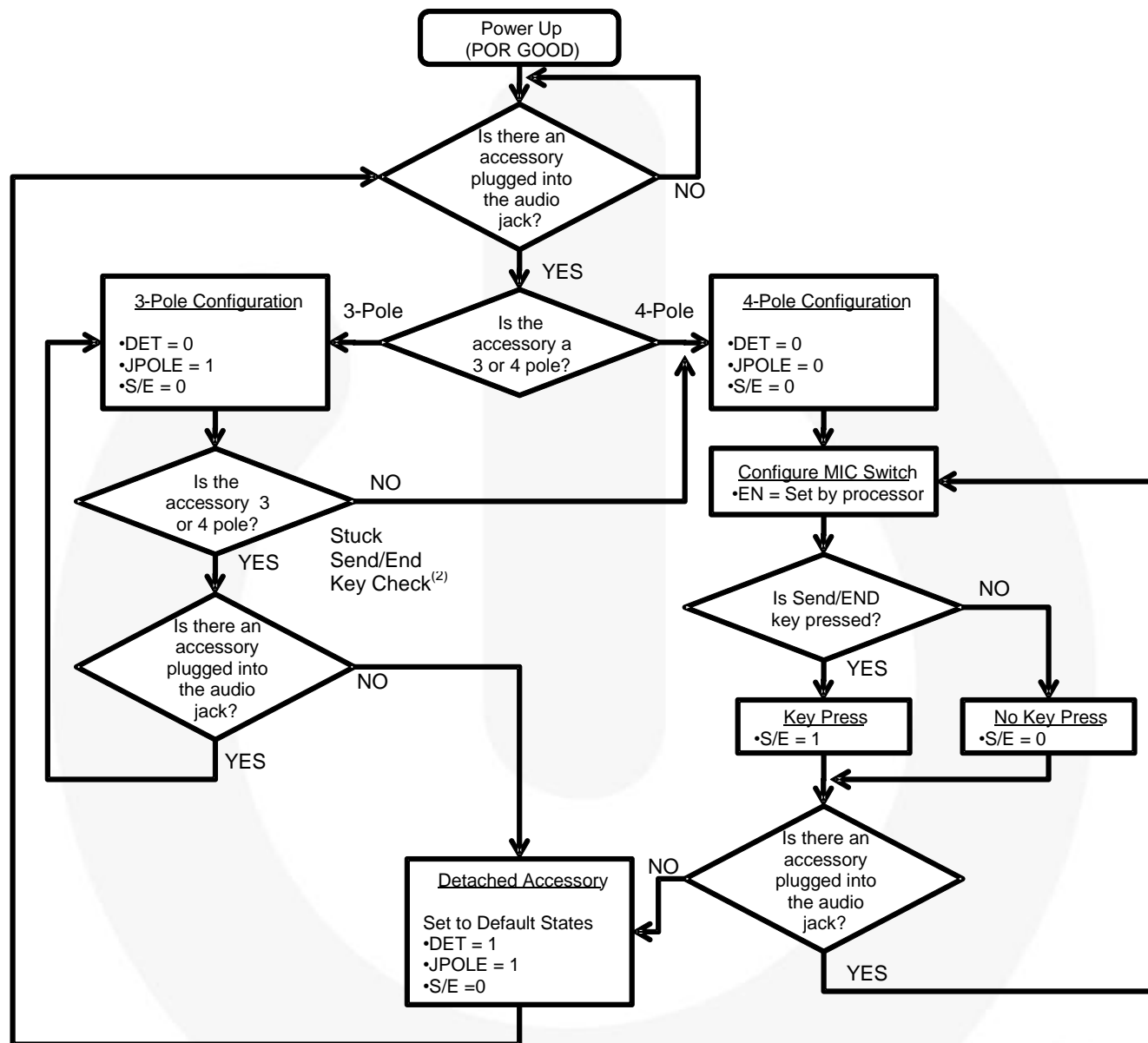**Figure 3.   Functional Flow Diagram**

Note:
2.   Stuck Send/End key function is only available if EN=HIGH.

Table 1.   FSA8028 Stuck Send/End Key

EN	FSA8028
HIGH	Stuck Send / End Key Active
LOW	Stuck Send / End Key Disabled

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)	HIGH (unplugged)	Open
	1	0						
	0	1						

Table 3.   FSA8028 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)	1 (3 Pole)	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

Note:
3.   State detected after initial plug-in.

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:
4.   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

DC Electrical Characteristics

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

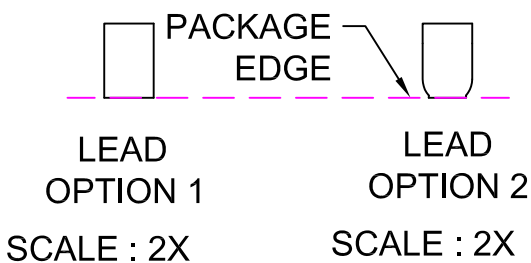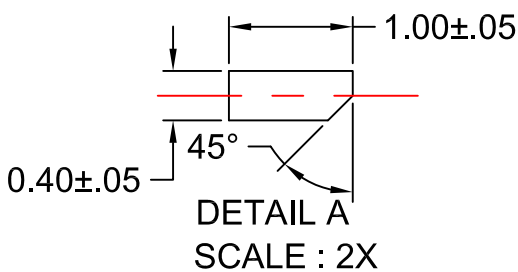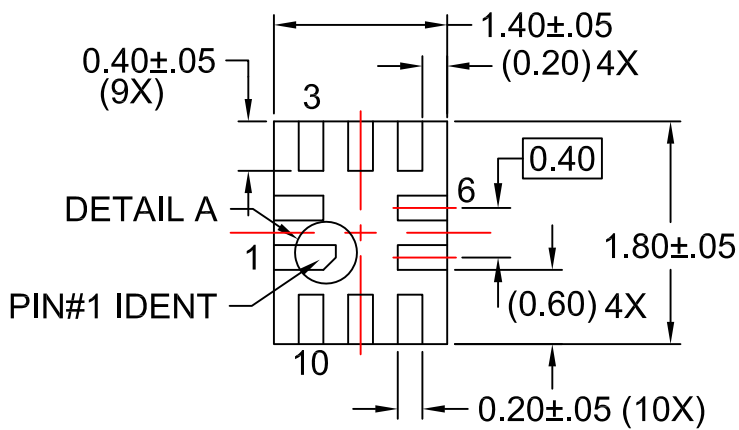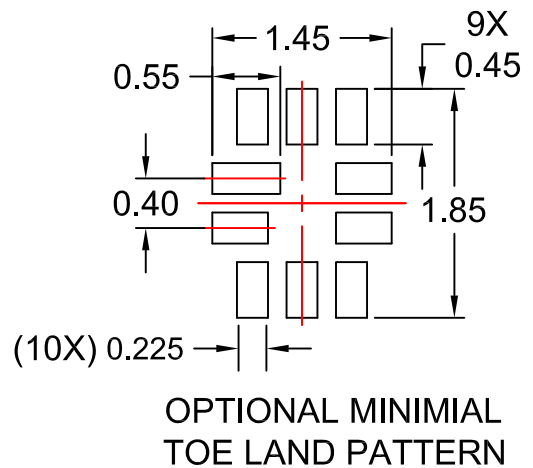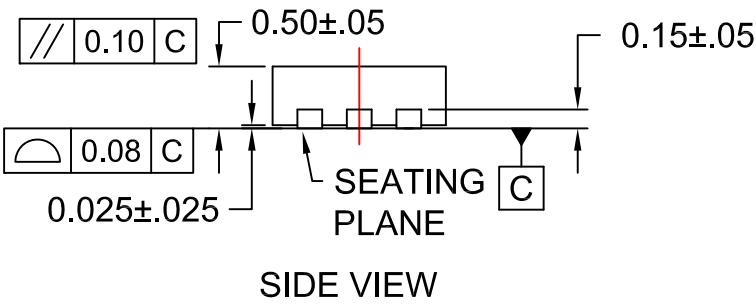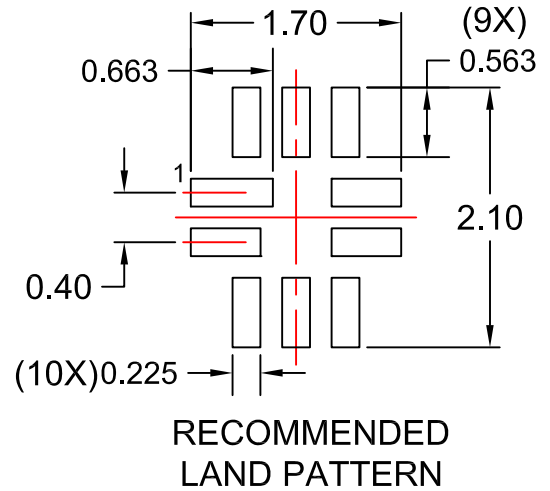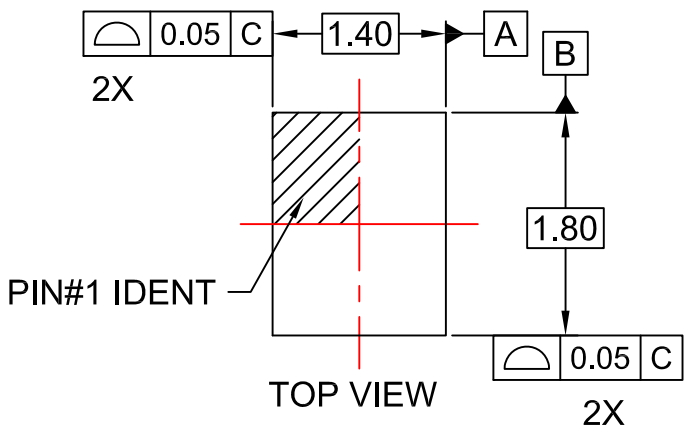| Symbol	Parameter	V_{DD} (V)	Conditions	T_A = -40 to +85°C			Units
				Min.	Typ.	Max.	
MIC Switch							
R_{ON}	MIC Switch On Resistance	2.5	I_{OUT} = 30 mA, V_{IN} = 2.0 V		0.9	2.9	Ω
		2.8			0.8	2.5	
		3.8			0.6	2.0	
$R_{FLAT(ON)}$	On Resistance Flatness	2.5	I_{OUT} = 30 mA, V_{IN} = 1.6, 2.0, 2.5 V		1.50		
		2.8	I_{OUT} = 30 mA, V_{IN} = 1.6, 2.0, 2.8 V		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							
J_DET_{AudioV}	Audio Voltage Range on J_DET Pin	2.5 to 4.4	DET = LOW	-1		1	V
J_DET_{Audiof}	Audio Frequency on J_DET Pin	2.5 to 4.4	DET = LOW	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				230		mV
Parallel I/O							
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
Comparator							
V_{COMP}	Comparator Threshold for SEND/END Sensing	2.5-3.8	J_DET, EN = LOW		620		mV
Current							
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 = LOW)		1	3	µA
$I_{CC-SLWA}$	Battery Supply Sleep Mode Current with Accessory Attached	2.5 to 4.4	Active Current (EN = LOW and/or DET = HIGH)		15	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	T_A = -40 to +85°C			Unit
				Min.	Typ.	Max.	
MIC Switch							
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							
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			1		ms
t_{PER}	Period of MIC Switching Time for Sensing SEND/END Button Press	2.5 to 4.4			10		ms
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			4.5		ms
t_{KBK}	Debounce Time for Sensing SEND/END Key Press / Release	2.5 to 4.4			27		ms
Power							
PSRR	Power Supply Rejection Ratio	3.8	Power Supply Noise 300 mV_{PP}, Measured 10/90%, f = 217 Hz		-90		dB

Table 4.   Package 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

TOP VIEW

| ⌓ | 0.05 | C |

1.40 → A

B

2X

PIN#1 IDENT

1.80

| ⌓ | 0.05 | C |

2X

SIDE VIEW

| ∥ | 0.10 | C |

0.50±.05

0.15±.05

| ⌓ | 0.08 | C |

0.025±.025

SEATING PLANE

C

BOTTOM VIEW

0.40±.05 (9X)

1.40±.05

(0.20) 4X

3

DETAIL A

0.40

6

PIN#1 IDENT

1

1.80±.05

(0.60) 4X

10

0.20±.05 (10X)

| ⊕ | 0.10 | C | A | B |
| | 0.05 | C | | |

DETAIL A
SCALE : 2X

1.00±.05

45°

0.40±.05

RECOMMENDED LAND PATTERN

1.70

(9X)

0.663

0.563

1

0.40

2.10

(10X)0.225

OPTIONAL MINIMIAL TOE LAND PATTERN

1.45

9X

0.55

0.45

0.40

1.85

(10X) 0.225

LEAD OPTION 1
SCALE : 2X

PACKAGE EDGE

LEAD OPTION 2
SCALE : 2X

NOTES:

A. PACKAGE DOES NOT CONFORM TO ANY JEDEC STANDARD.

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.

D. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.

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