# FSA8008A

# Audio Jack Detection and Configuration Switch

The FSA8008A is an audio jack detector and switch for 3− or 4−pole accessories. In addition to detection, the FSA8008A 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.

### Features

- 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

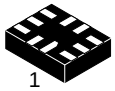
- 3.5 mm and 2.5 mm Audio Jacks
- Cellular Phones, Smartphones
- MP3 and PMP

### Related Resources

- FSA8008A Demonstration Board

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**UQFN10**
**CASE 523BC**

| | |
|---|---|
| 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 |
| Package | 10−Lead UMLP 1.4 x 1.8 x 0.5 mm, 0.4 mm Pitch |
| Top Mark | KD |
| Ordering Information | FSA8008AUMX |

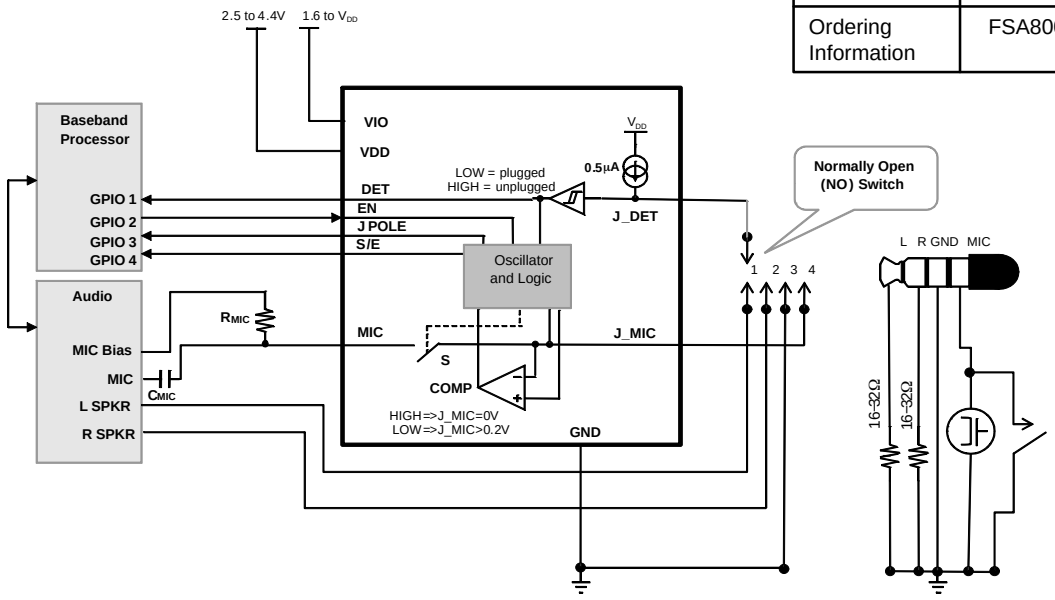



**Figure 1. Mobile Phone Example**

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**Pin Configuration**

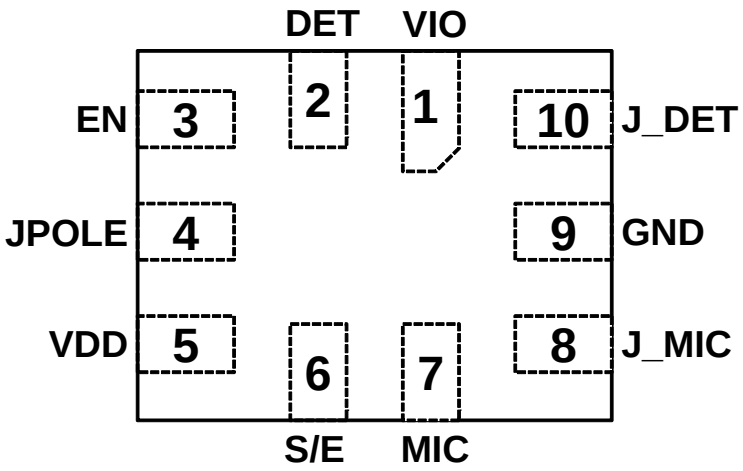



**Figure 2. 10−Lead UMLP Pin Assignment (Through View)**

**Table 1. 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 | | |

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

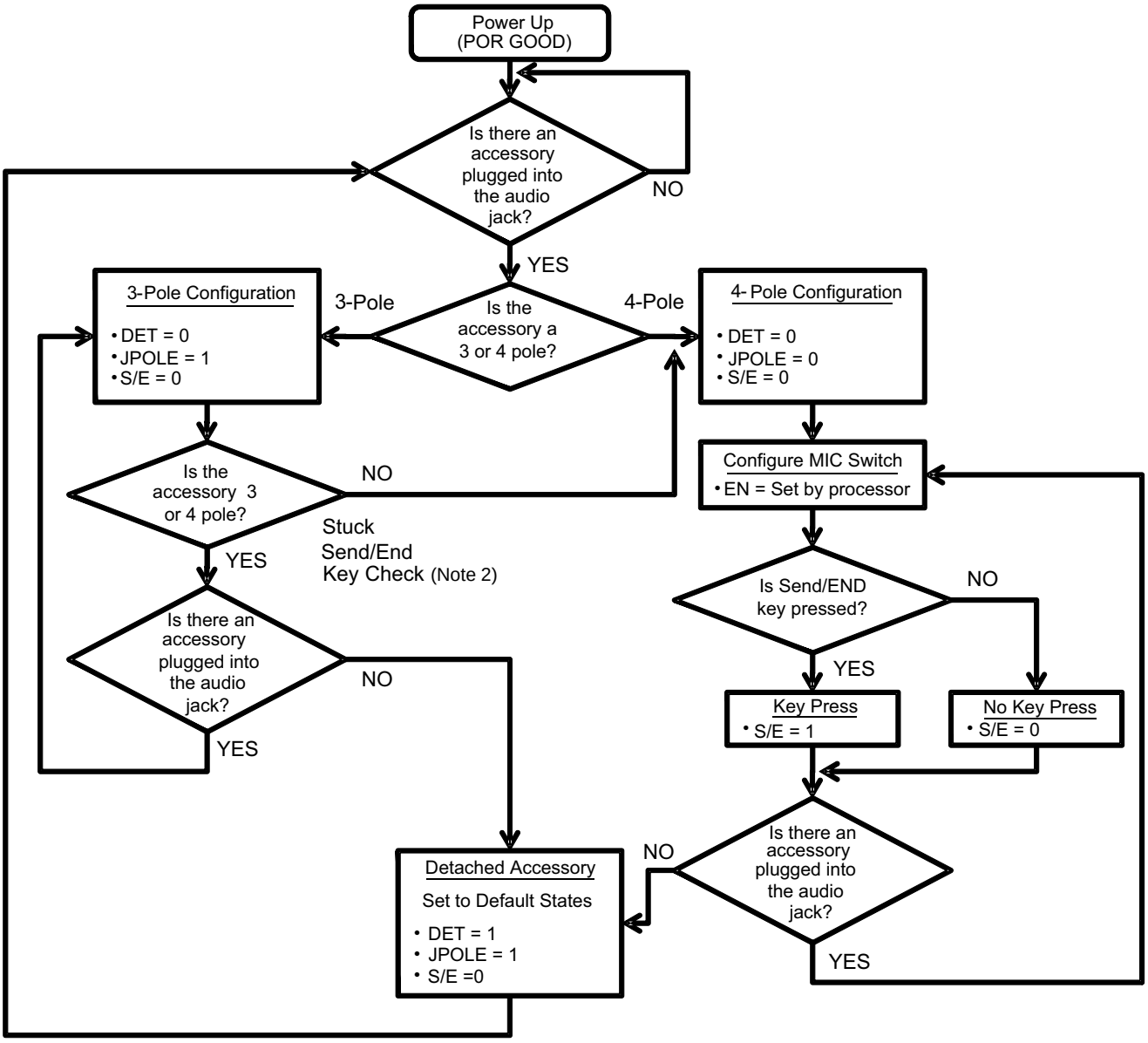



**Figure 3. Functional Flow Diagram**

2. Stuck Send/End key function is only available if EN=H.

**Table 2. STUCK SEND/END KEY**

| EN | FSA8008A |
|---|---|
| H | Stuck Send / End Key Active |
| L | Stuck Send / End Key Disabled |

**Table 3. 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 4. I/O STATES DURING DETECTION** (Note 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 |

3. State detected after initial plug−in.

**Table 5. ABSOLUTE MAXIMUM RATINGS**

| 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 | | |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

4. The input and output negative ratings may be exceeded if the input and output diode current ratings are observed.

**Table 6. RECOMMENDED OPERATING CONDITIONS**

| 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 | °C |

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

**Table 7. 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 | | 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** | | | | | | | |
| $J_DET_{AudioV}$ | 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** | | | | | | | |
| $V_{IH}$ | 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 = L | | 200 | | 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 = 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 |

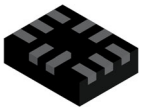
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

**Table 8. 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 | | |
| $t_{DET-IN}$ | 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 |

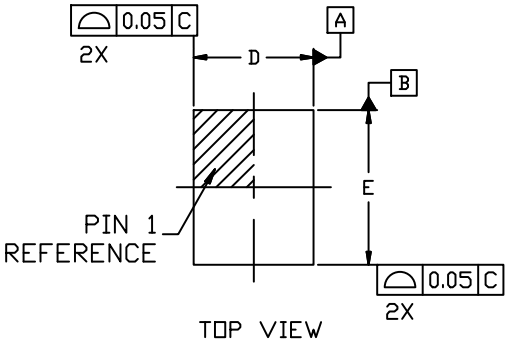
## ORDERING INFORMATION

| Part Number | Operating Temperature Range | Top Mark | Package |
|---|---|---|---|
| FSA8008AUMX | −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) |

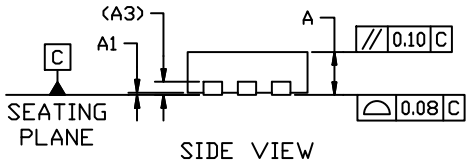


**UQFN10 1.4x1.8, 0.4P**
CASE 523BC
ISSUE B

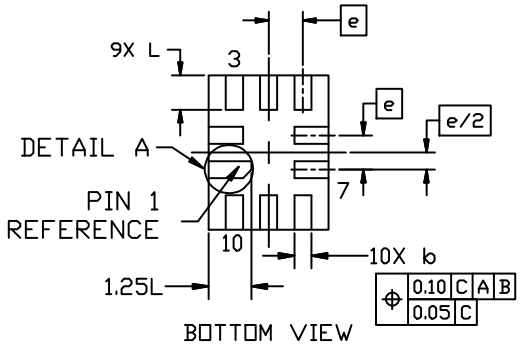
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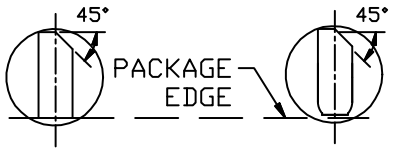

TOP VIEW




SIDE VIEW




BOTTOM VIEW



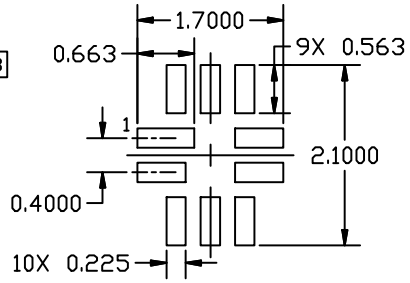

DETAIL A

OPTIONAL CONSTRUCTIONS

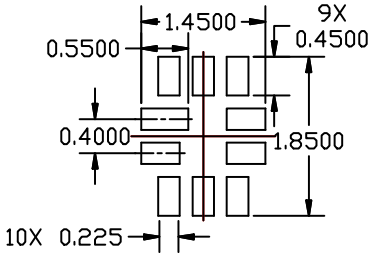
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2. ALL DIMENSIONS ARE IN MILLIMETERS
3. DIMENSION b APPLIES TO PLATED TERMINALS AND IS MEASURED BETWEEN 0.15mm AND 0.30mm FROM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS

| DIM | MILLIMETERS | | |
|---|---|---|---|
| | MIN. | NOM. | MAX. |
| A | 0.45 | 0.50 | 0.55 |
| A1 | 0.00 | 0.025 | 0.05 |
| A3 | 0.152 REF | | |
| b | 0.15 | 0.20 | 0.25 |
| D | 1.35 | 1.40 | 1.45 |
| E | 1.75 | 1.80 | 1.85 |
| e | 0.40 BSC | | |
| L | 0.35 | 0.40 | 0.45 |




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