

# FSA8108

## Audio Jack Detection Solution Featuring Volume Up/Down & Send/End Detection

### Features

- Detection:
  - Accessory Plug-In
  - Send / End Key Press
  - Volume Up/Down Key Press
- $V_{DD}$  2.7 to 4.5 V
- $V_{IO}$  1.6 V to  $V_{DD}$
- THD (MIC) 0.01% Typical
- LDO Output for MIC Bias Voltage: 2.4 V
- ESD (IEC 61000-4-2) 15 kV Air Gap
- Detects 3- or 4-Pole Audio Accessories
- Removes Audio Jack Pop-and-Click Caused by MIC Bias

### Description

The FSA8108 is an audio jack detection switch for 3- or 4-pole accessories that detects the audio plug connection. The FSA8108 detects volume up/down or send/end key presses. An LDO provides DC bias to microphone and remote key circuit in the accessory. For system flexibility, the FSA8108 features an I<sup>2</sup>C port with registers to allow programmability of AC timing specifications.

### Applications

- Cellular Phones, Smart Phones
- MP3 and PMP (Portable Media Player)

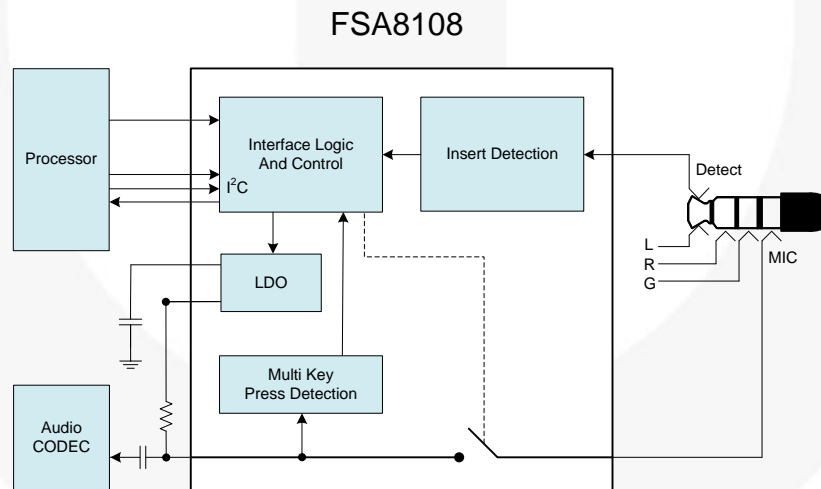


Figure 1. Typical Application Diagram

### Ordering Information

| Part Number                | Operating Temperature Range | Top Mark | Package   |
|----------------------------|-----------------------------|----------|---|
| FSA8108BUCX <sup>(1)</sup> | -40 to +85°C                | G6       | 12-Ball, 3 x 4 Array, 0.4 mm Pitch, 250 μm Ball, Wafer-Level Chip-Scale Package |

#### Note:

1. Includes backside lamination.

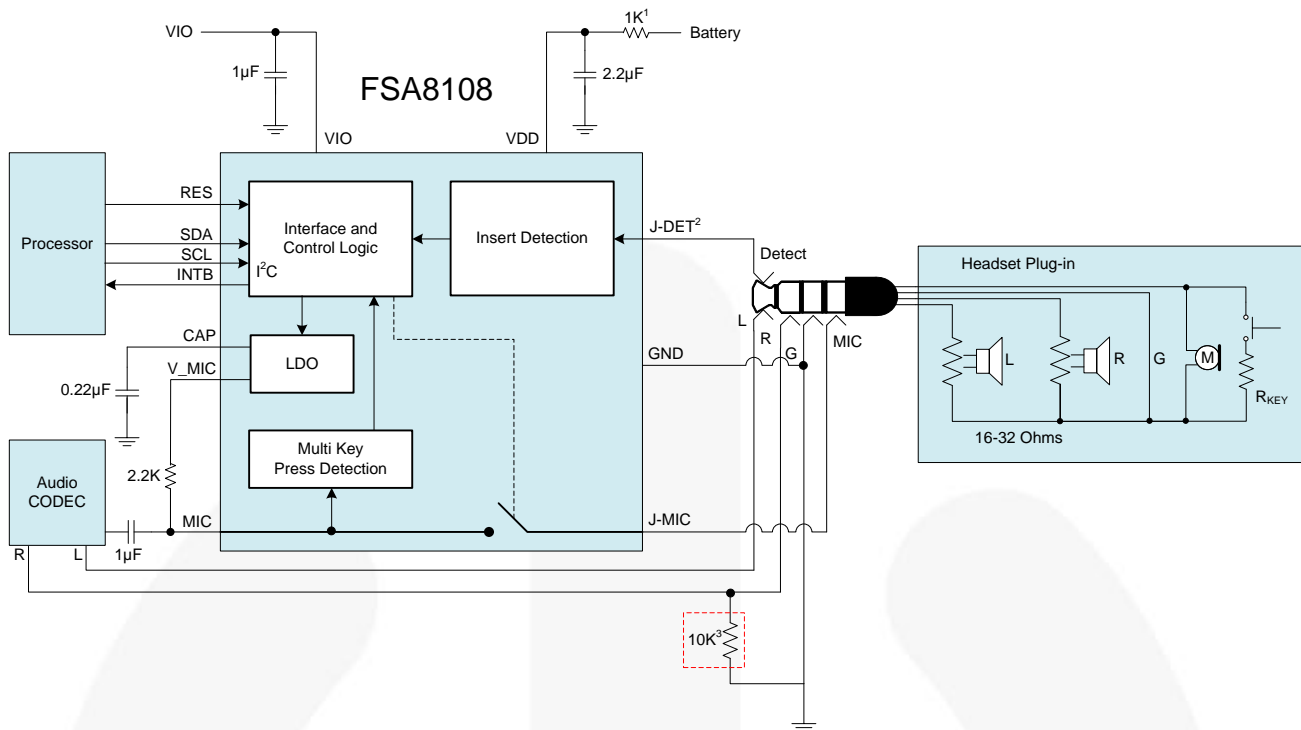
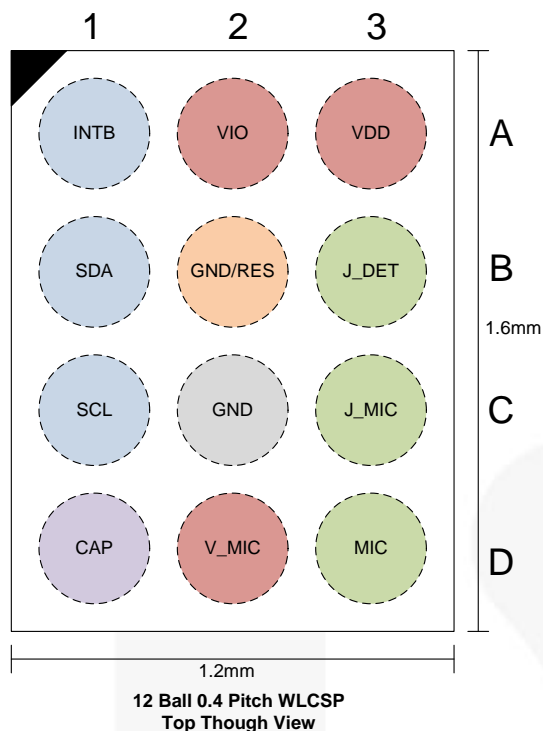


Figure 2. Typical Application Diagram

**Notes:**

2. A 1 kΩ resistor with a 2.2 µF capacitor is recommended for direct battery connection. This filter helps stabilize power rail events not associated with the FSA8039A. If power is supplied from a stable source, such as from a PMIC or LDO, a single 1 µF capacitor is recommended.
3. The J-DET is shorted to the left (L) audio channel when the headset or accessory plug is inserted into most audio jacks. Any external circuitry attached to the J-DET pin could affect audio performance in the 20-20 kHz range on the left channel.
4. The optional 10 kΩ resistor on the left channel is used to assist in detection of high-impedance accessories. This resistor has negligible impact on audio fidelity.

## Pin Configuration



**Figure 3. Pin Assignments**

## Pin Definitions

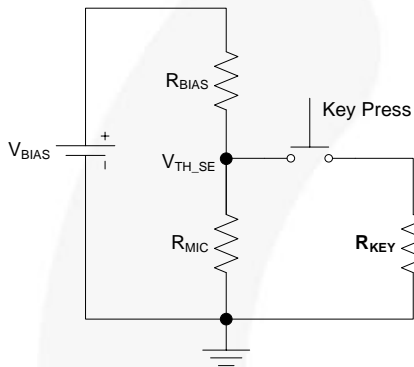
| Name  | PIN | Type   | Description   |
|-------|-----|--------|---|
| INTB  | A1  | Output | Interrupt. Low is interrupt asserted.   |
| SDA   | B1  | Data   | I <sup>2</sup> C data   |
| SCL   | C1  | Data   | I <sup>2</sup> C input clock  |
| CAP   | D1  | Output | Internal LDO output. A capacitor to ground is required.                       |
| VIO   | A2  | Power  | Baseband I/O supply voltage   |
| RES   | B2  | Input  | Device reset control. Active high reset. Connect to GND if unused.            |
| GND   | C2  | GND    | Ground  |
| V_MIC | D2  | Power  | LDO output to supply MIC bias voltage (2.4 V)                                 |
| VDD   | A3  | Power  | Core supply voltage   |
| J_DET | B3  | I/O    | Input from a pin of the audio jack socket; plug insert/removal detection pin. |
| J_MIC | C3  | I/O    | Microphone switch path that connects to the audio jack.                       |
| MIC   | D3  | I/O    | Microphone switch path that goes to the microphone input of the codec.        |

## Application Information

### Music Mode

When a 4-pole headset is inserted into the audio jack and a music/listening application is used, the MIC bias is normally enabled for headset button press detection (i.e. mute, volume change, etc.). This consumes power due to a constant path from the MIC bias resistor and microphone in the headset to GND. Fairchild has developed a Music Mode to enable the MIC switch periodically to monitor for a pressed button. This results in a power savings for battery-sensitive devices, such as cell phones or MP3 players. The FSA8108 enters Music Mode when the Music Mode Enable bit in CONTROL(0Ch) is set and a plug is inserted. Music Mode reduces MIC bias current by approximately 80% with the default Music Mode timing (09h) register value.

### LDO Operation



$$R_{VOL\ UP\ KEY\ MIN} = \frac{1}{\left(\frac{V_{BIAS\_MAX} - V_{TH\_KEY\_MIN}}{V_{TH\_KEY\_MIN}}\right) \frac{1}{R_{BIAS}} - \frac{1}{R_{MIC}}} = 132\Omega$$

$$R_{VOL\ UP\ KEY\ MAX} = \frac{1}{\left(\frac{V_{BIAS\_MIN} - V_{TH\_KEY\_MAX}}{V_{TH\_KEY\_MAX}}\right) \frac{1}{R_{BIAS}} - \frac{1}{R_{MIC}}} = 286\Omega$$

**Volume up Resistor**  
**V<sub>BIAS, LDO</sub> ±5%, 2.28V – 2.25V**  
**R<sub>BIAS</sub> = 2.2kΩ**  
**R<sub>MIC</sub> = 2kΩ**  
**V<sub>TH, KEY, Min</sub>: 120mV default +12%, 0.134V**  
**Max: 250mV default-7%, 0.233V**

Figure 4. Example Key-Press Resistor Calculations and Values

## 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.         | Unit |    |
|------------------|--|---|--------------|------|----|
| $V_{DD}, V_{IO}$ | Supply Voltage from Battery              | -0.5  | 6.0          | V    |    |
| $V_{SW}$         | Switch I/O Voltage                       | -0.5  | $V_{CC}+0.5$ | V    |    |
| $I_{V\_MIC}$     | $V\_MIC$ LDO Supply Current              |   | 15           | mA   |    |
| $I_{IK}$         | Input Clamp Diode Current                | -50   |              | mA   |    |
| $I_{SW}$         | Switch I/O Current                       |   | 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   | kV |
|                  |  | Contact   |              | 8    |    |
|                  | Human Body Model, JEDEC JESD22-A114      | J_DET vs. GND,<br>J_MIC vs. GND,<br>VDD vs. GND,<br>VIO vs. GND |              | 11   |    |
|                  |  | All Pins  |              | 4    |    |
|                  | Charged Device Model, JEDEC JESD22-C101  | All Pins  |              | 2    |    |

## 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.     | Unit       |
|---------------|---|------|----------|------------|
| $V_{DD}$      | Supply Voltage  | 2.7  | 4.5      | V          |
| $V_{IO}$      | I/O Supply Voltage  | 1.6  | $V_{DD}$ | V          |
| $T_A$         | Operating Temperature   | -40  | +85      | °C         |
| $V_{IN}$      | MIC Switch Input Voltage Range                                | 0    | $V_{DD}$ | V          |
| $V_{Audio}$   | Audio Voltage Range on J_DET Pin                              | -1   | 1        | V          |
| $f_{Audio}$   | Audio Frequency on J_DET Pin                                  | 20   | 20000    | Hz         |
| $J\_DET_{RL}$ | Resistance on Audio Accessory Left Channel to generate Attach |      | 500      | k $\Omega$ |

## DC Electrical Characteristics

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

| Symbol  | Parameter   | $V_{DD}$ (V) | Condition   | $T_A=-40$ to $+85^\circ\text{C}$ |      |                    | Unit          |
|---|---|--------------|---|----------------------------------|------|--------------------|---------------|
|   |   |              |   | Min.                             | Typ. | Max.               |               |
| <b>MIC Switch</b>   |   |              |   |                                  |      |                    |               |
| $R_{ON}$  | MIC Switch On Resistance  | 3.8          | $I_{OUT}=24$ mA, $V_{IN}=2.0$ V                   |                                  | 0.8  | 2.5                | $\Omega$      |
| $R_{FLAT}$  | On Resistance Flatness  | 3.8          | $I_{OUT}=24$ mA, $V_{IN}=1$ V to $V_{DD}$         |                                  | 0.7  |                    | $\Omega$      |
| $C_{ON(MIC)}$   | MIC Switch On Capacitance   | 3.8          | $f=1$ MHz, $V_{IN}=100$ mV, $50$ mV <sub>PP</sub> |                                  | 16   |                    | pF            |
| $C_{OFF(MIC)}$  | MIC Switch Off Capacitance  | 3.8          | $f=1$ MHz, $V_{IN}=100$ mV, $50$ mV <sub>PP</sub> |                                  | 30   |                    | pF            |
| <b>J-DET</b>  |   |              |   |                                  |      |                    |               |
| $J\_DET_{HYS}$  | Hysteresis of J_DET   |              |   |                                  | 200  |                    | mV            |
| <b>Parallel I/O Control Signals</b>                                     |   |              |   |                                  |      |                    |               |
|   |   |              |   |                                  |      |                    |               |
| $V_{IL}$  | Low-Level Input Voltage   |              |   |                                  |      | $0.3 \cdot V_{IO}$ | V             |
| $V_{IH}$  | High-Level Input Voltage  |              |   | $0.7 \cdot V_{IO}$               |      | $V_{IO}$           | V             |
| <b>I<sup>2</sup>C Controller DC Characteristics Fast Mode (400 kHz)</b> |   |              |   |                                  |      |                    |               |
| $V_{IL}$  | Low-Level Input Voltage   |              |   | -0.5                             |      | $0.3 V_{IO}$       | V             |
| $V_{IH}$  | High-Level Input Voltage  |              |   | $0.7 V_{IO}$                     |      |                    | V             |
| $V_{HYS}$   | Hysteresis of Schmitt Trigger Inputs                                  |              | $V_{IO}>2$ V                                      |                                  |      | $0.05 V_{IO}$      | V             |
|   |   |              | $V_{IO}<2$ V                                      |                                  |      | $0.1 V_{IO}$       |               |
| $V_{OL1}$   | Output Voltage (Open-Drain)   |              | $V_{IO}>2$ V, 3 mA                                | 0                                |      | 0.4                | V             |
|   |   |              | $V_{IO}<2$ V, 3 mA                                |                                  |      | $0.2 V_{IO}$       | V             |
| $I_{2C}$  | Input Current of SDA and SCL Pins, Input Voltage 0.26 V to 2.34 V     |              |   | -10                              |      | 10                 | $\mu\text{A}$ |
| $C_I$   | Capacitance for Each I/O Pin <sup>(5)</sup>                           |              |   |                                  |      | 10                 | pF            |
| <b>Current Consumption</b>  |   |              |   |                                  |      |                    |               |
| $I_{OZ}$  | Off Leakage Current   | 4.5          | MIC and J_MIC Port $V_{IN}=4.4$ V                 |                                  |      | 1.5                | $\mu\text{A}$ |
| $I_{IN}$  | Input Leakage Current   | 0 to 4.5     | Inputs 0 to 4.4 V                                 |                                  | 1    |                    | $\mu\text{A}$ |
| $I_{DD-SLNA}$   | Sleep Mode Current with No Accessory                                  | 2.7 to 4.5   | J_DET=1   |                                  | 1.5  |                    | $\mu\text{A}$ |
| $I_{DD-SLWA}$   | Current After Detection With Accessory (Normal Mode)                  | 2.7 to 4.5   | J_DET=0   |                                  | 35   |                    | $\mu\text{A}$ |
| $I_{DD-MUSIC\_MODE}$  | Music Mode  | 2.7 to 4.5   | I <sup>2</sup> C Default Settings                 |                                  | 25   |                    | $\mu\text{A}$ |
| $I_{DD\_LDO}$   | Current to Operating LDO, Not Including Output Current                | 2.7 to 4.5   | LDO Powered                                       |                                  | 110  |                    | $\mu\text{A}$ |
| $I_{DD-SLWA+LDO}$   | Current After Detection With Accessory (Normal Mode) with LDO Current | 2.7 to 4.5   | J_DET=0   |                                  | 145  |                    | $\mu\text{A}$ |
| $I_{DD\_Music\ Mode+LDO}$   | Music Mode with LDO   | 2.7 to 4.5   | I <sup>2</sup> C Default Settings                 |                                  | 135  |                    | $\mu\text{A}$ |

Continued on the following page...

## DC Electrical Characteristics

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

| Symbol   | Parameter  | $V_{DD}$ (V) | Condition   | $T_A=-40$ to $+85^\circ\text{C}$ |      |      | Unit |
|--|--|--------------|---|----------------------------------|------|------|------|
|  |  |              |   | Min.                             | Typ. | Max. |      |
| <b>MIC_V LDO Outputs</b>   |  |              |   |                                  |      |      |      |
| MIC_V <sub>VOUT</sub>  | Output Voltage   | 2.7 to 4.5   |   | -5%                              | 2.4  | +5%  | V    |
| MIC_V <sub>IOUT</sub>  | Maximum Output Current                                   | 2.7 to 4.5   |   | 10                               |      |      | mA   |
| <b>Comparator Thresholds for Headset Key Pad (Default Voltage Reference)</b> |  |              |   |                                  |      |      |      |
| V <sub>COMP1</sub>   | Comparator Threshold for Send/End Sensing for NO Headset | 2.7 to 4.5   | I <sup>2</sup> C Default Setting, V <sub>MIC</sub> =2.4 V, R <sub>MIC</sub> =2.2 k $\Omega$ | -12%                             | 120  | +12% | mV   |
| V <sub>COMP2</sub>   | Comparator Threshold for Send/End Sensing for NC Headset | 2.7 to 4.5   | I <sup>2</sup> C Default Setting, V <sub>MIC</sub> =2.4 V, R <sub>MIC</sub> =2.2 k $\Omega$ | -5%                              | 2300 | +5%  | mV   |
| V <sub>COMP3</sub>   | Comparator Threshold for Volume_Up Sensing               | 2.7 to 4.5   | I <sup>2</sup> C Default Setting, V <sub>MIC</sub> =2.4 V, R <sub>MIC</sub> =2.2 k $\Omega$ | -7%                              | 250  | +7%  | mV   |
| V <sub>COMP4</sub>   | Comparator Threshold for Volume_Down Sensing             | 2.7 to 4.5   | I <sup>2</sup> C Default Setting, V <sub>MIC</sub> =2.4 V, R <sub>MIC</sub> =2.2 k $\Omega$ | -7%                              | 690  | +7%  | mV   |

**Note:**

- Not production tested.

## AC Electrical Characteristics

All typical values are at  $T_A=25^{\circ}\text{C}$  unless otherwise specified; all other values are at the recommended  $T_A$  and  $T_J$  temperatures. Not production tested.

| Symbol                               | Parameter   | $V_{DD}$ (V) | Condition   | $T_A=-40$ to $+85^{\circ}\text{C}$ |      |      | Unit          |
|--------------------------------------|---|--------------|---|------------------------------------|------|------|---------------|
|                                      |   |              |   | Min.                               | Typ. | Max. |               |
| <b>MIC Switch</b>                    |   |              |   |                                    |      |      |               |
| THD                                  | Total Harmonic Distortion   | 3.8          | $R_T=600\ \Omega$ , $V_{SW}=0.5\ V_{PP}$ ,<br>$f=20\ \text{Hz}$ to $20\ \text{kHz}$ , $V_{IN}=2.0\ \text{V}$      |                                    | 0.01 |      | %             |
| $O_{IRR}$                            | Off Isolation   | 3.8          | $f=20\ \text{kHz}$ , $R_S=600\ \Omega$ ,<br>$C_L=0\ \text{pF}$ , $R_T=600\ \Omega$                                |                                    | 80   |      | dB            |
| <b>Parallel I/O (Default Timing)</b> |   |              |   |                                    |      |      |               |
| $t_{ON}$                             | Switch Turn-On Time   | 3.8          | $R_L=10\ \text{k}\Omega$ , $C_L=10\ \text{pF}$  |                                    | 100  |      | $\mu\text{s}$ |
| $t_{OFF}$                            | Switch Turn-Off Time  | 3.8          | $R_L=10\ \text{k}\Omega$ , $C_L=10\ \text{pF}$  |                                    | 10   |      | ns            |
| $t_{DET-IN}$                         | Debounce Time after J_DET Changes from HIGH to LOW                | 2.7 to 4.5   | I <sup>2</sup> C Default Setting  |                                    | 500  |      | ms            |
| $t_{DET-REM}$                        | Debounce Time after J_DET Changes from Low to HIGH                | 2.7 to 4.5   | I <sup>2</sup> C Default Setting  |                                    | 30   |      | $\mu\text{s}$ |
| $t_{DET-MIC}$                        | Detection Time of Audio Jack GND and MIC Terminals                | 2.7 to 4.5   | I <sup>2</sup> C Default Setting  |                                    | 50   |      | ms            |
| $t_{ESD\_DE}$                        | Debounce Time for ESD Event on J_DET (Double-Check J_DET Status)  | 2.7 to 4.5   | I <sup>2</sup> C Default Setting  |                                    | 1    |      | ms            |
| $t_{POLL}$                           | ON Time of MIC Switch for Sensing SEND/END Key Press in MP3 Mode  | 2.7 to 4.5   | I <sup>2</sup> C Default Setting  |                                    | 15   |      | ms            |
| $t_{WAIT}$                           | OFF Time of MIC Switch for Sensing SEND/END Key Press in MP3 Mode | 2.7 to 4.5   | I <sup>2</sup> C Default Setting  |                                    | 150  |      | ms            |
| $t_{K BK}$                           | Debounce Time for Sensing SEND/END Key Press/Release              | 2.7 to 4.5   | I <sup>2</sup> C Default Setting  |                                    | 45   |      | ms            |
| $t_{KEY-LONG}$                       | Minimum Time for Long Key Press                                   | 2.7 to 4.5   | I <sup>2</sup> C Default Setting  |                                    | 900  |      | ms            |
| $t_{KEY-Double}$                     | Maximum Time between Key Presses for Double-Key Press             | 2.7 to 4.5   | I <sup>2</sup> C Default Setting  |                                    | 1000 |      | ms            |
| $t_{RES\_DE}$                        | Debounce Time for Reset Control                                   | 2.7 to 4.5   |   |                                    | 15   |      | $\mu\text{s}$ |
| <b>Power Supply Noise Immunity</b>   |   |              |   |                                    |      |      |               |
| $PSRR_{SW}$                          | Power Supply Rejection Ratio for Switch                           | 3.8          | Power Supply Noise<br>300 mV <sub>PP</sub> , Measured<br>10/90%, $f=217\ \text{Hz}$                               |                                    | 95   |      | dB            |
| $PSRR_{LDO}$                         | Power Supply Rejection Ratio for LDO                              | 3.8          | Power Supply Noise<br>300 mV <sub>PP</sub> , Measured<br>10/90%, $f=217\ \text{Hz}$ ,<br>$C_{EXT}=1\ \mu\text{F}$ |                                    | 100  |      | dB            |

## I<sup>2</sup>C Specifications (Fast Mode)

| Symbol              | Parameter   | Min.                 | Max. | Unit |
|---------------------|---|----------------------|------|------|
| f <sub>SCL</sub>    | SCL Clock Frequency   | 0                    | 400  | kHz  |
| t <sub>HD;STA</sub> | Hold Time (Repeated) START Condition                              | 0.6                  |      | μs   |
| t <sub>LOW</sub>    | LOW Period of SCL Clock   | 1.3                  |      | μs   |
| t <sub>HIGH</sub>   | HIGH Period of SCL Clock  | 0.6                  |      | μs   |
| t <sub>SU;STA</sub> | Set-up Time for Repeated START Condition                          | 0.6                  |      | μs   |
| t <sub>HD;DAT</sub> | Data Hold Time  | 0                    | 0.9  | μs   |
| t <sub>SU;DAT</sub> | Data Set-up Time <sup>(6)</sup>                                   | 100                  |      | ns   |
| t <sub>r</sub>      | Rise Time of SDA and SCL Signals <sup>(6,7)</sup>                 | 20+0.1C <sub>b</sub> | 300  | ns   |
| t <sub>f</sub>      | Fall Time of SDA and SCL Signals <sup>(6,7)</sup>                 | 20+0.1C <sub>b</sub> | 300  | ns   |
| t <sub>SU;STO</sub> | Set-up Time for STOP Condition                                    | 0.6                  |      | μs   |
| t <sub>BUF</sub>    | BUS-Free Time between STOP and START Conditions                   | 1.3                  |      | μs   |
| t <sub>SP</sub>     | Pulse Width of Spikes that Must Be Suppressed by the Input Filter | 0                    | 50   | ns   |

### Notes:

- A Fast-Mode I<sup>2</sup>C-Bus® device can be used in a Standard-Mode I<sup>2</sup>C-Bus system; but the requirement t<sub>SU;DAT</sub> ≥ 250 ns must be met. This is automatically the case if the device does not stretch the LOW period of the I2C\_SCL signal. If the device does stretch the LOW period of the I2C\_SCL signal, it must output the next data bit to the I2C\_SDA line t<sub>r,max</sub> + t<sub>SU;DAT</sub> = 1000 + 250 = 1250 ns (according to the Standard-Mode I<sup>2</sup>C Bus specification) before the I2C\_SCL line is released.
- C<sub>b</sub> equals the total capacitance of one BUS line in pF. If mixed with high-speed devices, faster fall times are allowed according to the I<sup>2</sup>C specification.

## I<sup>2</sup>C Timing

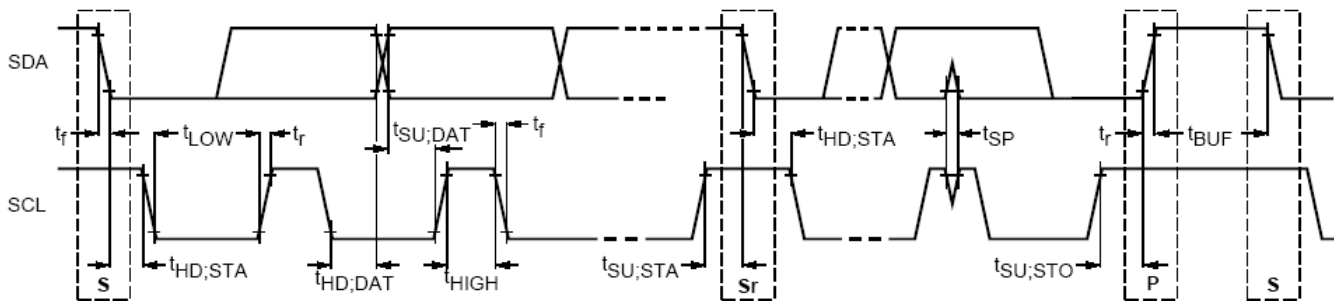


Figure 5. Definition of Timing for Full-Speed Mode Devices on the I<sup>2</sup>C Bus

| Name          | Size(Bits) | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0      |
|---------------|------------|-------|-------|-------|-------|-------|-------|-------|------------|
| Slave Address | 8          | 0     | 1     | 0     | 0     | 0     | 1     | 1     | Read/White |

Figure 6. I<sup>2</sup>C Slave Address

Table 1. Register Definitions

| Address | Register             | Type | Reset Values | Bit 7   | Bit 6                      | Bit 5                             | Bit 4                           | Bit 3   | Bit 2                           | Bit 1                         | Bit 0                    |              |
|---------|----------------------|------|--------------|---|----------------------------|-----------------------------------|---------------------------------|---|---------------------------------|-------------------------------|--------------------------|--------------|
| 01H     | Device ID            | R    | 00000000     | Version ID  |                            |                                   |                                 | Reserved  |                                 |                               |                          |              |
| 02H     | Interrupt 1          | R    | 00000000     | Reserved  |                            | Send/End Long Key Press           | Send/End Double Key Press       | Send/End Key Press  | Plug Disconnect                 | 4-Pole Plug Connect           | 3-Pole Plug Connect      |              |
| 03H     | Interrupt 2          | R    | 00000000     | Reserved  |                            | Volume Down Long Key release      | Volume Down Long Key Press      | Volume Down Key Press   | Volume Up Long Key release      | Volume Up Long Key Press      | Volume Up Key Press      |              |
| 04H     | Interrupt Mask 1     | R/W  | 00000000     | Reserved  |                            | Send/End Long Key Press Mask      | Send/End Double Key Press Mask  | Send/End Key Press Mask   | Plug Disconnect Mask            | 4-Pole Plug Connect Mask      | 3-Pole Plug Connect Mask |              |
| 05H     | Interrupt Mask 2     | R/W  | 00000000     | Reserved  |                            | Volume Down Long Key release Mask | Volume Down Long Key Press Mask | Volume Down Key Press Mask  | Volume Up Long Key Release Mask | Volume Up Long Key Press Mask | Volume Up Key Press Mask |              |
| 06H     | Global Multiplier    | R/W  | 00000100     | Reserved  |                            |                                   |                                 |   | Global Multiplier Number        |                               |                          |              |
| 07H     | J_DET Timing         | R/W  | 10000010     | Insert ( $t_{\text{DET-IN}}$ )  |                            |                                   |                                 | Removal ( $t_{\text{DET-REM}}$ ) Global Multiplier Does not apply |                                 |                               |                          |              |
| 08H     | Key Press Timing     | R/W  | 01111000     | Double Key Press Timing ( $t_{\text{KEY-DOUBLE}}$ )                       |                            |                                   |                                 | Long Key Press Timing ( $t_{\text{KEY-LONG}}$ )                   |                                 |                               |                          |              |
| 09H     | Music Mode Timing    | R/W  | 00101000     | Key Press Polling Time ( $t_{\text{POLL}}$ )                              |                            |                                   |                                 | Key Press Waiting Time ( $t_{\text{WAIT}}$ )                      |                                 |                               |                          |              |
| 0AH     | Detection Timing     | R/W  | 01010101     | Key Press timing for volume up and volume down ( $t_{\text{KEY-PRESS}}$ ) |                            |                                   |                                 | Detection Time ( $t_{\text{DET-MIC}}$ )                           |                                 |                               |                          |              |
| 0BH     | Debounce Timing      | R/W  | 10011000     | Debounce for ESD Event on J_DET ( $t_{\text{ESD-DE}}$ )                   |                            |                                   |                                 | Key Press Debounce Timing ( $t_{\text{KBK}}$ )                    |                                 |                               |                          |              |
| 0CH     | Control              | R/W  | 01001000     | Stuck S/E On/Off  | All Key as Send/End On/Off | Double Key Press On/Off           | Long Key Press On/Off           | Music Mode  | Jack Det On/Off                 | 3/ 4-Pole Det On/Off          | LDO Output On/Off        |              |
| 0DH     | Detection Thresholds | R/W  | 11101010     | Comparator 2 (Send/End Key - Normally Closed)                             |                            |                                   |                                 | Comparator 1 (Send/End Key - Normally Open)                       |                                 |                               |                          |              |
| 0EH     | Detection Thresholds | R/W  | 01111001     | Comparator 4 (Volume Down)  |                            |                                   |                                 | Comparator 3 (Volume Down)  |                                 |                               |                          |              |
| 0FH     | Reset Control        | R/W  | 00000000     | Reserved  |                            |                                   |                                 |   |                                 |                               | Jack Removal Reset       | Global Reset |
| 10H     | Reserved             | R/W  | Reserved     | Reserved  |                            |                                   |                                 |   |                                 |                               |                          |              |

**Notes:**

8. Write "0" to undefined register bits.
9. Values read from undefined register bits are not defined and are invalid.
10. Blocks in green color mean setting change is implemented upon next use.
11. Blocks in blue color mean setting change is implemented after jack removal.

**Table 2. I<sup>2</sup>C Control**

Reserved Register bit read out as 0

Address: 01H

Reset Value: 00000000

Type: Read

| Device ID |            |      | Default            | 00000000 |
|-----------|------------|------|--------------------|----------|
| Bit #     | Name       | Size | Function           |          |
| 0:3       | Reserved   | 4    | Do Not Use         |          |
| 4:7       | Version ID | 4    | 0000 = Version 0.0 |          |
|           |            |      | 0001 = Version 0.1 |          |

**Table 3. Interrupt 1**

Address: 02H

Reset Value: 00000000

Type: Read/Clear

| Interrupt 1 |                           |      | Default                            | 00000000 |
|-------------|---------------------------|------|------------------------------------|----------|
| Bit #       | Name                      | Size | Function                           |          |
| 0           | 3-Pole Plug Connect       | 1    | 0: No Headset Connected            |          |
|             |                           |      | 1: 3-Pole Headset Connected        |          |
| 1           | 4-Pole Plug Connect       | 1    | 0: No Headset Connected            |          |
|             |                           |      | 1: 4-Pole Headset Connected        |          |
| 2           | Plug Disconnect           | 1    | 0: No Update                       |          |
|             |                           |      | 1: Headset Disconnected            |          |
| 3           | Send/End Key Press        | 1    | 0: Send/End Key Not Pressed        |          |
|             |                           |      | 1: Send/End Key Pressed            |          |
| 4           | Send/End Double Key Press | 1    | 0: Send/End Double Key Not Pressed |          |
|             |                           |      | 1: Send/End Double Key Pressed     |          |
| 5           | Send/End Long Key Press   | 1    | 0: Send/End Long Key not Pressed   |          |
|             |                           |      | 1: Send/End Long Key Pressed       |          |
| 6:7         | Reserved                  | 2    | Do Not Use                         |          |

**Table 4. Interrupt 2**

Address: 03H

Reset Value: 00000000

Type: Read/Clear

| Interrupt 2 |                              |      | Default                             | 00000000 |
|-------------|------------------------------|------|-------------------------------------|----------|
| Bit #       | Name                         | Size | Function                            |          |
| 0           | Volume Up Key Press          | 1    | 0: Volume Up key not pressed        |          |
|             |                              |      | 1: Volume Up key pressed            |          |
| 1           | Volume Up Key Long Press     | 1    | 0: Volume Up Long key not pressed   |          |
|             |                              |      | 1: Volume Up Long key pressed       |          |
| 2           | Volume Up Key Long Release   | 1    | 0: Volume Up Long key not released  |          |
|             |                              |      | 1: Volume Up Long key released      |          |
| 3           | Volume Down Key Press        | 1    | 0: Volume Down key not pressed      |          |
|             |                              |      | 1: Volume Down Key Press            |          |
| 4           | Volume Down Long Key Press   | 1    | 0: Volume Down Long Key Not Pressed |          |
|             |                              |      | 1: Volume Down Long Key Pressed     |          |
| 5           | Volume Down Long Key Release | 1    | 0: Volume Down Key Not Released     |          |
|             |                              |      | 1: Volume Down Key Released         |          |
| 6:7         | Reserved                     | 2    | Do Not Use                          |          |

**Table 5. Interrupt Mask 1**

Address: 04H

Reset Value: 00000000

Type: Read/Write

| Interrupt Mask 1 |                           |      | Default  | 00000000 |
|------------------|---------------------------|------|--|----------|
| Bit #            | Name                      | Size | Function   |          |
| 0                | 3-Pole Plug Connect       | 1    | 0: Do Not Mask 3-Pole Plug Connect Interrupt       |          |
|                  |                           |      | 1: Mask 3-Pole Plug Connect Interrupt              |          |
| 1                | 4-Pole Plug Connect       | 1    | 0: Do Not Mask 4-Pole Plug Connect Interrupt       |          |
|                  |                           |      | 1: Mask 4-Pole Plug Connect Interrupt              |          |
| 2                | Plug Disconnect           | 1    | 0: Do Not Mask Plug Disconnect Interrupt           |          |
|                  |                           |      | 1: Mask Plug Disconnect Interrupt                  |          |
| 3                | Send/End Key Press        | 1    | 0: Do Not Mask Send/End Key Press Interrupt        |          |
|                  |                           |      | 1: Mask Send/End Key Press Interrupt               |          |
| 4                | Send/End Double Key Press | 1    | 0: Do Not Mask Send/End Key Double Press Interrupt |          |
|                  |                           |      | 1: Mask Send/End Key Double Key Press Interrupt    |          |
| 5                | Send/End Long Key Press   | 1    | 0: Do Not Mask Send/End Long Key Press Interrupt   |          |
|                  |                           |      | 1: Mask Send/End Long Key Press Interrupt          |          |
| 6:7              | Reserved                  | 2    | Do Not Use   |          |

**Table 6. Interrupt Mask 2**

Address: 05H

Reset Value: 00000000

Type: Read/Write

| Interrupt Mask 2 |                              |      | Default   | 00000000 |
|------------------|------------------------------|------|---|----------|
| Bit #            | Name                         | Size | Function  |          |
| 0                | Volume Up Key Press          | 1    | 0: Do Not Mask Volume Up Key Press Interrupt        |          |
|                  |                              |      | 1: Mask Volume Up Key Press Interrupt               |          |
| 1                | Volume Up Key Long Press     | 1    | 0: Do Not Mask Volume Up Long Key Press Interrupt   |          |
|                  |                              |      | 1: Mask Volume Up Long Key Press Interrupt          |          |
| 2                | Volume Up Key Long Release   | 1    | 0: Do Not Mask Volume Up Long Key Release Interrupt |          |
|                  |                              |      | 1: Mask Volume Up Long Key Release Interrupt        |          |
| 3                | Volume Down Key Press        | 1    | 0: Do Not Mask Volume Down Key Press Interrupt      |          |
|                  |                              |      | 1: Mask Volume Down Key Press Interrupt             |          |
| 4                | Volume Down Long Key Press   | 1    | 0: Do Not Mask Volume Down Long Key Press Interrupt |          |
|                  |                              |      | 1: Mask Volume Down Long Key Press Interrupt        |          |
| 5                | Volume Down Long Key Release | 1    | 0: Do Not Mask Volume Down key Release Interrupt    |          |
|                  |                              |      | 1: Mask Volume Down key released Interrupt          |          |
| 6:7              | Reserved                     | 2    | Do Not Use  |          |

**Table 7. Global Multiplier Number**

Address: 06H

Reset Value: 00000100

Type: Read/Write

| Global Multiplier Number |       |       |       |       |       |       |       | Default  | 00000100 |
|--------------------------|-------|-------|-------|-------|-------|-------|-------|----------|----------|
| Bit 7                    | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 | Function |          |
| Reserved                 |       |       |       |       | 0     | 0     | 0     | 1/16     |          |
| Reserved                 |       |       |       |       | 0     | 0     | 1     | 1/8      |          |
| Reserved                 |       |       |       |       | 0     | 1     | 0     | 1/4      |          |
| Reserved                 |       |       |       |       | 0     | 1     | 1     | 1/2      |          |
| Reserved                 |       |       |       |       | 1     | 0     | 0     | 1        |          |
| Reserved                 |       |       |       |       | 1     | 0     | 1     | 2        |          |
| Reserved                 |       |       |       |       | 1     | 1     | 0     | 4        |          |
| Reserved                 |       |       |       |       | 1     | 1     | 1     | 8        |          |

**Table 8. J\_DET Timing**

Address: 07H

Reset Value: 10000010

Type: Read/Write

| J_DET Timing             |       |       |       |          |   |       |       |       |          | Default | 10000010 |
|--------------------------|-------|-------|-------|----------|---|-------|-------|-------|----------|---------|----------|
| Insert ( $t_{DET\_IN}$ ) |       |       |       |          | Removal ( $t_{DET\_REM}$ ) (Global Multiplier Does Not Apply) |       |       |       |          |         |          |
| Bit 7                    | Bit 6 | Bit 5 | Bit 4 | Function | Bit 3   | Bit 2 | Bit 1 | Bit 0 | Function |         |          |
| 0                        | 0     | 0     | 0     | 100      | 0   | 0     | 0     | 0     | 10       |         |          |
| 0                        | 0     | 0     | 1     | 150      | 0   | 0     | 0     | 1     | 20       |         |          |
| 0                        | 0     | 1     | 0     | 200      | 0   | 0     | 1     | 0     | 30       |         |          |
| 0                        | 0     | 1     | 1     | 250      | 0   | 0     | 1     | 1     | 40       |         |          |
| 0                        | 1     | 0     | 0     | 300      | 0   | 1     | 0     | 0     | 50       |         |          |
| 0                        | 1     | 0     | 1     | 350      | 0   | 1     | 0     | 1     | 60       |         |          |
| 0                        | 1     | 1     | 0     | 400      | 0   | 1     | 1     | 0     | 70       |         |          |
| 0                        | 1     | 1     | 1     | 450      | 0   | 1     | 1     | 1     | 80       |         |          |
| 1                        | 0     | 0     | 0     | 500      | 1   | 0     | 0     | 0     | 90       |         |          |
| 1                        | 0     | 0     | 1     | 550      | 1   | 0     | 0     | 1     | 100      |         |          |
| 1                        | 0     | 1     | 0     | 600      | 1   | 0     | 1     | 0     | 110      |         |          |
| 1                        | 0     | 1     | 1     | 650      | 1   | 0     | 1     | 1     | 120      |         |          |
| 1                        | 1     | 0     | 0     | 700      | 1   | 1     | 0     | 0     | 130      |         |          |
| 1                        | 1     | 0     | 1     | 750      | 1   | 1     | 0     | 1     | 140      |         |          |
| 1                        | 1     | 1     | 0     | 800      | 1   | 1     | 1     | 0     | 140      |         |          |
| 1                        | 1     | 1     | 1     | 850      | 1   | 1     | 1     | 1     | 140      |         |          |

**Table 9. Key Press Timing**

Address: 08H

Reset Value: 01111000

Type: Read/Write

| Key Press Timing                  |       |       |       |          |                               |       |       |       |          | Default | 00101000 |
|-----------------------------------|-------|-------|-------|----------|-------------------------------|-------|-------|-------|----------|---------|----------|
| Double Key Press ( $t_{DOUBLE}$ ) |       |       |       |          | Long Key Press ( $t_{LONG}$ ) |       |       |       |          |         |          |
| Bit 7                             | Bit 6 | Bit 5 | Bit 4 | Function | Bit 3                         | Bit 2 | Bit 1 | Bit 0 | Function |         |          |
| 0                                 | 0     | 0     | 0     | 100      | ms                            | 0     | 0     | 0     | 0        | 500     | ms       |
| 0                                 | 0     | 0     | 1     | 200      |                               | 0     | 0     | 0     | 1        | 550     |          |
| 0                                 | 0     | 1     | 0     | 300      |                               | 0     | 0     | 1     | 0        | 600     |          |
| 0                                 | 0     | 1     | 1     | 400      |                               | 0     | 0     | 1     | 1        | 650     |          |
| 0                                 | 1     | 0     | 0     | 500      |                               | 0     | 1     | 0     | 0        | 700     |          |
| 0                                 | 1     | 0     | 1     | 600      |                               | 0     | 1     | 0     | 1        | 750     |          |
| 0                                 | 1     | 1     | 0     | 800      |                               | 0     | 1     | 1     | 0        | 800     |          |
| 0                                 | 1     | 1     | 1     | 1000     |                               | 0     | 1     | 1     | 1        | 850     |          |
| 1                                 | 0     | 0     | 0     | 1100     |                               | 1     | 0     | 0     | 0        | 900     |          |
| 1                                 | 0     | 0     | 1     | 1200     |                               | 1     | 0     | 0     | 1        | 1000    |          |
| 1                                 | 0     | 1     | 0     | 1300     |                               | 1     | 0     | 1     | 0        | 1100    |          |
| 1                                 | 0     | 1     | 1     | 1400     |                               | 1     | 0     | 1     | 1        | 1200    |          |
| 1                                 | 1     | 0     | 0     | 1500     |                               | 1     | 1     | 0     | 0        | 1300    |          |
| 1                                 | 1     | 0     | 1     | 1600     |                               | 1     | 1     | 0     | 1        | 1400    |          |
| 1                                 | 1     | 1     | 0     | 1800     |                               | 1     | 1     | 1     | 0        | 1500    |          |
| 1                                 | 1     | 1     | 1     | 2000     |                               | 1     | 1     | 1     | 1        | 2000    |          |

**Table 10. Music Mode Timing**

Address: 09H

Reset Value: 01011000

Type: Read/Write

| Music Mode Timing                     |       |       |       |          |                                       |       |       |       |          | Default | 01011000 |
|---------------------------------------|-------|-------|-------|----------|---------------------------------------|-------|-------|-------|----------|---------|----------|
| Key Press Polling Time ( $t_{POLL}$ ) |       |       |       |          | Key Press Waiting Time ( $t_{WAIT}$ ) |       |       |       |          |         |          |
| Bit 7                                 | Bit 6 | Bit 5 | Bit 4 | Function | Bit 3                                 | Bit 2 | Bit 1 | Bit 0 | Function |         |          |
| 0                                     | 0     | 0     | 0     | 5        | ms                                    | 0     | 0     | 0     | 0        | 5       | ms       |
| 0                                     | 0     | 0     | 1     | 10       |                                       | 0     | 0     | 0     | 1        | 10      |          |
| 0                                     | 0     | 1     | 0     | 15       |                                       | 0     | 0     | 1     | 0        | 15      |          |
| 0                                     | 0     | 1     | 1     | 20       |                                       | 0     | 0     | 1     | 1        | 20      |          |
| 0                                     | 1     | 0     | 0     | 25       |                                       | 0     | 1     | 0     | 0        | 25      |          |
| 0                                     | 1     | 0     | 1     | 30       |                                       | 0     | 1     | 0     | 1        | 30      |          |
| 0                                     | 1     | 1     | 0     | 35       |                                       | 0     | 1     | 1     | 0        | 50      |          |
| 0                                     | 1     | 1     | 1     | 40       |                                       | 0     | 1     | 1     | 1        | 100     |          |
| 1                                     | 0     | 0     | 0     | 45       |                                       | 1     | 0     | 0     | 0        | 150     |          |
| 1                                     | 0     | 0     | 1     | 50       |                                       | 1     | 0     | 0     | 1        | 200     |          |
| 1                                     | 0     | 1     | 0     | 60       |                                       | 1     | 0     | 1     | 0        | 250     |          |
| 1                                     | 0     | 1     | 1     | 70       |                                       | 1     | 0     | 1     | 1        | 300     |          |
| 1                                     | 1     | 0     | 0     | 80       |                                       | 1     | 1     | 0     | 0        | 350     |          |
| 1                                     | 1     | 0     | 1     | 90       |                                       | 1     | 1     | 0     | 1        | 400     |          |
| 1                                     | 1     | 1     | 0     | 100      |                                       | 1     | 1     | 1     | 0        | 450     |          |
| 1                                     | 1     | 1     | 1     | 150      |                                       | 1     | 1     | 1     | 1        | 500     |          |

**Table 11. Detection Timing**

Address: 0AH

Reset Value: 01010101

Type: Read/Write

| Detection Timing   |       |       |       |          | Default                           | 01010101 |       |       |          |     |    |
|--|-------|-------|-------|----------|-----------------------------------|----------|-------|-------|----------|-----|----|
| Key Press Timing for Volume Up and Volume Down ( $t_{KEY}$ ) |       |       |       |          | Detection Time ( $t_{DET\_MIC}$ ) |          |       |       |          |     |    |
| Bit 7  | Bit 6 | Bit 5 | Bit 4 | Function | Bit 3                             | Bit 2    | Bit 1 | Bit 0 | Function |     |    |
| 0  | 0     | 0     | 0     | 50       | ms                                | 0        | 0     | 0     | 0        | 5   | ms |
| 0  | 0     | 0     | 1     | 100      |                                   | 0        | 0     | 0     | 1        | 10  |    |
| 0  | 0     | 1     | 0     | 150      |                                   | 0        | 0     | 1     | 0        | 15  |    |
| 0  | 0     | 1     | 1     | 200      |                                   | 0        | 0     | 1     | 1        | 20  |    |
| 0  | 1     | 0     | 0     | 250      |                                   | 0        | 1     | 0     | 0        | 25  |    |
| 0  | 1     | 0     | 1     | 300      |                                   | 0        | 1     | 0     | 1        | 50  |    |
| 0  | 1     | 1     | 0     | 350      |                                   | 0        | 1     | 1     | 0        | 75  |    |
| 0  | 1     | 1     | 1     | 400      |                                   | 0        | 1     | 1     | 1        | 100 |    |
| 1  | 0     | 0     | 0     | 450      |                                   | 1        | 0     | 0     | 0        | 150 |    |
| 1  | 0     | 0     | 1     | 500      |                                   | 1        | 0     | 0     | 1        | 200 |    |
| 1  | 0     | 1     | 0     | 550      |                                   | 1        | 0     | 1     | 0        | 250 |    |
| 1  | 0     | 1     | 1     | 600      |                                   | 1        | 0     | 1     | 1        | 300 |    |
| 1  | 1     | 0     | 0     | 650      |                                   | 1        | 1     | 0     | 0        | 350 |    |
| 1  | 1     | 0     | 1     | 700      |                                   | 1        | 1     | 0     | 1        | 400 |    |
| 1  | 1     | 1     | 0     | 750      |                                   | 1        | 1     | 1     | 0        | 450 |    |
| 1  | 1     | 1     | 1     | 800      |                                   | 1        | 1     | 1     | 1        | 500 |    |

**Table 12. Key Press Debounce Timing**

Address: 0BH

Reset Value: 10011000

Type: Read/Write

| Key Press Debounce Timing  |       |       |       |          | Default                   | 10011000 |       |       |          |    |    |
|--|-------|-------|-------|----------|---------------------------|----------|-------|-------|----------|----|----|
| Debounce Timing for ESD Event on J_DET<br>(Global Multiplier Does Not Apply) |       |       |       |          | Key Press Debounce Timing |          |       |       |          |    |    |
| Bit 7  | Bit 6 | Bit 5 | Bit 4 | Function | Bit 3                     | Bit 2    | Bit 1 | Bit 0 | Function |    |    |
| 0  | 0     | 0     | 0     | 100      | μs                        | 0        | 0     | 0     | 0        | 5  | ms |
| 0  | 0     | 0     | 1     | 200      |                           | 0        | 0     | 0     | 1        | 10 |    |
| 0  | 0     | 1     | 0     | 300      |                           | 0        | 0     | 1     | 0        | 15 |    |
| 0  | 0     | 1     | 1     | 400      |                           | 0        | 0     | 1     | 1        | 20 |    |
| 0  | 1     | 0     | 0     | 500      |                           | 0        | 1     | 0     | 0        | 25 |    |
| 0  | 1     | 0     | 1     | 600      |                           | 0        | 1     | 0     | 1        | 30 |    |
| 0  | 1     | 1     | 0     | 700      |                           | 0        | 1     | 1     | 0        | 35 |    |
| 0  | 1     | 1     | 1     | 800      |                           | 0        | 1     | 1     | 1        | 40 |    |
| 1  | 0     | 0     | 0     | 900      |                           | 1        | 0     | 0     | 0        | 45 |    |
| 1  | 0     | 0     | 1     | 1000     |                           | 1        | 0     | 0     | 1        | 50 |    |
| 1  | 0     | 1     | 0     | 1200     |                           | 1        | 0     | 1     | 0        | 55 |    |
| 1  | 0     | 1     | 1     | 1400     |                           | 1        | 0     | 1     | 1        | 60 |    |
| 1  | 1     | 0     | 0     | 1600     |                           | 1        | 1     | 0     | 0        | 65 |    |
| 1  | 1     | 0     | 1     | 1800     |                           | 1        | 1     | 0     | 1        | 70 |    |
| 1  | 1     | 1     | 0     | 2000     |                           | 1        | 1     | 1     | 0        | 75 |    |
| 1  | 1     | 1     | 1     | 5000     |                           | 1        | 1     | 1     | 1        | 80 |    |

**Table 13. Control 1**

Address: 0CH  
 Reset Value: 01001000  
 Type: Read/Write

| Control 1 |                              |      | Default   | 01001000 |
|-----------|------------------------------|------|---|----------|
| Bit #     | Name                         | Size | Function  |          |
| 0         | LDO Output                   | 1    | 0: LDO Output On<br>1: LDO Output Off                                     |          |
| 1         | MIC Detection                | 1    | 0: MIC Detection On<br>1: MIC Detection Off                               |          |
| 2         | Jack detection               | 1    | 0: Jack Detection On<br>1: Jack Detection Off                             |          |
| 3         | Music Mode                   | 1    | 0: Music Mode On<br>1: Music Mode Off                                     |          |
| 4         | Long Key Press Function      | 1    | 0: Long Key Press Function On<br>1: Long Key Press Function Off           |          |
| 5         | Double Key Press Function    | 1    | 0: Double Key Press Function On<br>1: Double Key Press Function Off       |          |
| 6         | All Key as Send/End Function | 1    | 0: All Key as Send/End Function On<br>1: All Key as Send/End Function Off |          |
| 7         | Stuck S/E Function           | 1    | 0: Stuck Send/End Function On<br>1: Stuck Send/End Function OFF           |          |

**Table 14. Detection Thresholds 1**

Address: 0DH  
 Reset Value: 11101010  
 Type: Read/Write

| Detection Thresholds 1  |       |       |       |             |   |       |       |       |            | Default | 11101010 |
|-------------------------|-------|-------|-------|-------------|---|-------|-------|-------|------------|---------|----------|
| Normally Closed S/E Key |       |       |       |             | Normally Open S/E Key Maximum/Volume up Key Minimum |       |       |       |            |         |          |
| Bit 7                   | Bit 6 | Bit 5 | Bit 4 | Function    | Bit 3   | Bit 2 | Bit 1 | Bit 0 | Function   |         |          |
| 0                       | 0     | 0     | 0     | 1000        | 0   | 0     | 0     | 0     | 20         |         |          |
| 0                       | 0     | 0     | 1     | 1100        | 0   | 0     | 0     | 1     | 30         |         |          |
| 0                       | 0     | 1     | 0     | 1200        | 0   | 0     | 1     | 0     | 40         |         |          |
| 0                       | 0     | 1     | 1     | 1300        | 0   | 0     | 1     | 1     | 50         |         |          |
| 0                       | 1     | 0     | 0     | 1400        | 0   | 1     | 0     | 0     | 60         |         |          |
| 0                       | 1     | 0     | 1     | 1500        | 0   | 1     | 0     | 1     | 70         |         |          |
| 0                       | 1     | 1     | 0     | 1600        | 0   | 1     | 1     | 0     | 80         |         |          |
| 0                       | 1     | 1     | 1     | 1650        | 0   | 1     | 1     | 1     | 90         |         |          |
| 1                       | 0     | 0     | 0     | 1700        | 1   | 0     | 0     | 0     | 100        |         |          |
| 1                       | 0     | 0     | 1     | 1750        | 1   | 0     | 0     | 1     | 110        |         |          |
| 1                       | 0     | 1     | 0     | 1800        | 1   | 0     | 1     | 0     | <b>120</b> |         |          |
| 1                       | 0     | 1     | 1     | 1900        | 1   | 0     | 1     | 1     | 130        |         |          |
| 1                       | 1     | 0     | 0     | 2000        | 1   | 1     | 0     | 0     | 140        |         |          |
| 1                       | 1     | 0     | 1     | 2200        | 1   | 1     | 0     | 1     | 150        |         |          |
| 1                       | 1     | 1     | 0     | <b>2300</b> | 1   | 1     | 1     | 0     | 160        |         |          |
| 1                       | 1     | 1     | 1     | 2400        | 1   | 1     | 1     | 1     | 170        |         |          |

**Table 15. Detection Thresholds 2**

Address: 0EH

Reset Value: 01110111

Type: Read/Write

| Detection Thresholds 2  |       |       |       |          |   |       |       |       |          | Default | 01111001 |
|-------------------------|-------|-------|-------|----------|---|-------|-------|-------|----------|---------|----------|
| Volume Down Key Maximum |       |       |       |          | Volume Up Key Maximum/Volume Down Key Minimum |       |       |       |          |         |          |
| Bit 7                   | Bit 6 | Bit 5 | Bit 4 | Function | Bit 3   | Bit 2 | Bit 1 | Bit 0 | Function |         |          |
| 0                       | 0     | 0     | 0     | 270      | mV  | 0     | 0     | 0     | 0        | 110     | mV       |
| 0                       | 0     | 0     | 1     | 330      |   | 0     | 0     | 0     | 1        | 125     |          |
| 0                       | 0     | 1     | 0     | 390      |   | 0     | 0     | 1     | 0        | 145     |          |
| 0                       | 0     | 1     | 1     | 450      |   | 0     | 0     | 1     | 1        | 160     |          |
| 0                       | 1     | 0     | 0     | 510      |   | 0     | 1     | 0     | 0        | 175     |          |
| 0                       | 1     | 0     | 1     | 570      |   | 0     | 1     | 0     | 1        | 190     |          |
| 0                       | 1     | 1     | 0     | 630      |   | 0     | 1     | 1     | 0        | 205     |          |
| 0                       | 1     | 1     | 1     | 690      |   | 0     | 1     | 1     | 1        | 220     |          |
| 1                       | 0     | 0     | 0     | 750      |   | 1     | 0     | 0     | 0        | 235     |          |
| 1                       | 0     | 0     | 1     | 810      |   | 1     | 0     | 0     | 1        | 250     |          |
| 1                       | 0     | 1     | 0     | 870      |   | 1     | 0     | 1     | 0        | 265     |          |
| 1                       | 0     | 1     | 1     | 930      |   | 1     | 0     | 1     | 1        | 280     |          |
| 1                       | 1     | 0     | 0     | 990      |   | 1     | 1     | 0     | 0        | 295     |          |
| 1                       | 1     | 0     | 1     | 1050     |   | 1     | 1     | 0     | 1        | 310     |          |
| 1                       | 1     | 1     | 0     | 1120     |   | 1     | 1     | 1     | 0        | 325     |          |
| 1                       | 1     | 1     | 1     | 1190     |   | 1     | 1     | 1     | 1        | 340     |          |

**Table 16. Reset Control**

Address: 0FH

Reset Value: 00000000

Type: Read/Write

| Reset Control |                    |      | Default  | 00000000 |
|---------------|--------------------|------|--|----------|
| Bit #         | Name               | Size | Function   |          |
| 0             | Global Reset       | 1    | 0: No Change<br>1: Reset Device Reset to all I2C into default values (timing, comparator threshold ) |          |
| 1             | Jack Removal Reset | 1    | 0: No Change<br>1: Clear I2C register related to Jack Removal process (interrupt)                    |          |
| 2:7           | Reserved           | 5    | Do Not Use   |          |

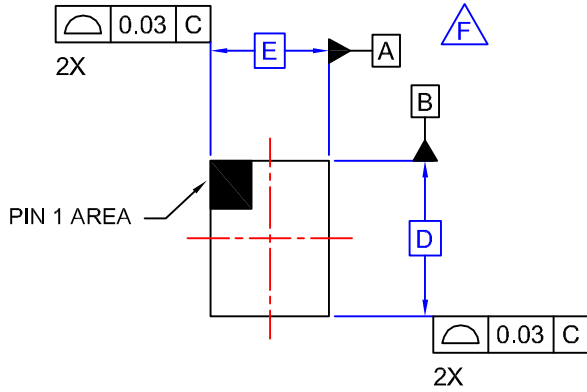
**Nominal Values**

| Bump Pitch | Overall Package Height | Silicon Thickness | Solder Bump Height | Solder Bump Diameter |
|------------|------------------------|-------------------|--------------------|----------------------|
| 0.4 mm     | 0.586 mm               | 0.378 mm          | 0.208 mm           | 0.260 mm             |

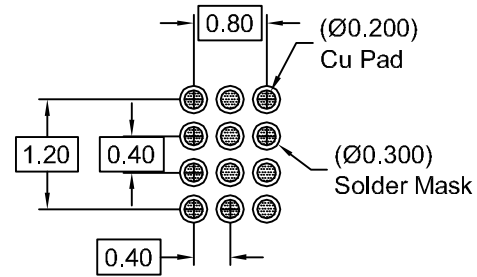
**Package Specific Dimensions**

| D       | E       | X       | Y       |
|---------|---------|---------|---------|
| 1.56 mm | 1.16 mm | 0.18 mm | 0.18 mm |

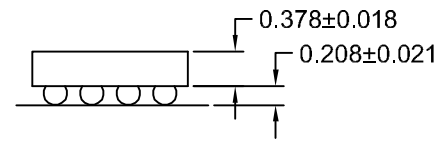
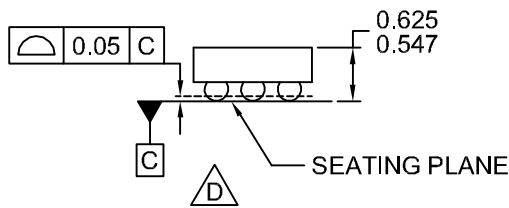
| REVISIONS |                          |         |                   |
|-----------|--------------------------|---------|-------------------|
| REV       | DESCRIPTION              | DATE    | APP'D / SITE      |
| 1         | Initial drawing release. | 8-19-09 | L. England / FSME |



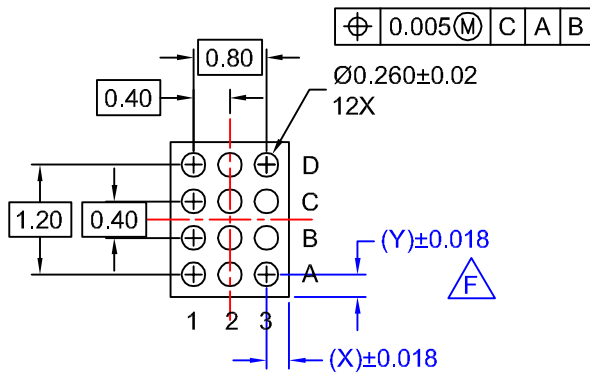
TOP VIEW



RECOMMENDED LAND PATTERN  
(NSMD PAD TYPE)



SIDE VIEWS



BOTTOM VIEW

NOTES:

- A. NO JEDEC REGISTRATION APPLIES.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
- D.** DATUM C IS DEFINED BY THE SPHERICAL CROWNS OF THE BALLS.
- E. PACKAGE NOMINAL HEIGHT IS 586 MICRONS ±39 MICRONS (547-625 MICRONS).
- F.** FOR DIMENSIONS D, E, X, AND Y SEE PRODUCT DATASHEET.
- G. DRAWING FILENAME: MKT-UC012ACrev1.

|                  |            |             |  |                |              |
|------------------|------------|-------------|--|----------------|--------------|
| <b>APPROVALS</b> |            | <b>DATE</b> |  |                |              |
| DRAWN            | L. England | 8-19-09     |  |                |              |
| DFTG. CHK.       | S. Martin  | 8-19-09     |  |                |              |
| ENGR. CHK.       |            |             |  |                |              |
|                  |            |             | <b>12BALL WLCSP, 3X4 ARRAY</b><br><b>0.4MM PITCH, 250UM BALL</b> |                |              |
|                  |            | SCALE       | SIZE   | DRAWING NUMBER | REV          |
|                  |            | N/A         | N/A  | MKT-UC012AC    | 1            |
|                  |            |             | DO NOT SCALE DRAWING   |                | SHEET 1 of 1 |



**TRADEMARKS**

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

- |                          |  |                                       |                  |
|--------------------------|--|---------------------------------------|------------------|
| AccuPower™               | F-PFS™   | OPTOPLANAR®                           | SYSTEM GENERAL®  |
| AttitudeEngine™          | FRFET®   | Power Supply WebDesigner™             | TinyBoost®       |
| Awinda®                  | Global Power Resource <sup>SM</sup>            | PowerTrench®                          | TinyBuck®        |
| AX-CAP®*                 | GreenBridge™                                   | PowerXS™                              | TinyCalc™        |
| BitSiC™                  | Green FPS™                                     | Programmable Active Droop™            | TinyLogic®       |
| Build it Now™            | Green FPS™ e-Series™                           | QFET®                                 | TINYOPTO™        |
| CorePLUS™                | Gmax™  | QS™                                   | TinyPower™       |
| CorePOWER™               | GTO™   | Quiet Series™                         | TinyPWM™         |
| CROSSVOL™                | IntelliMAX™                                    | RapidConfigure™                       | TinyWire™        |
| CTL™                     | ISOPLANAR™                                     | Saving our world, 1mW/W/kW at a time™ | TranSiC™         |
| Current Transfer Logic™  | Making Small Speakers Sound Louder and Better™ | SignalWise™                           | TriFault Detect™ |
| DEUXPEED®                | MegaBuck™                                      | SmartMax™                             | TRUECURRENT®*    |
| Dual Cool™               | MICROCOUPLER™                                  | SMART START™                          | μSerDes™         |
| EcoSPARK®                | MicroFET™                                      | Solutions for Your Success™           | UHC®             |
| EfficientMax™            | MicroPak™                                      | SPM®                                  | Ultra FRFET™     |
| ESBC™                    | MicroPak2™                                     | STEALTH™                              | UniFET™          |
| F <sup>®</sup>           | MillerDrive™                                   | SuperFET®                             | VCX™             |
| Fairchild®               | MotionMax™                                     | SuperSOT™-3                           | VisualMax™       |
| Fairchild Semiconductor® | MotionGrid®                                    | SuperSOT™-6                           | VoltagePlus™     |
| FACT Quiet Series™       | MTi®   | SuperSOT™-8                           | XST™             |
| FACT®                    | MTx®   | SupreMOS®                             | Xsens™           |
| FastvCore™               | MVN®   | SyncFET™                              | 仙童®              |
| FETBench™                | mWSaver®                                       | Sync-Lock™                            |                  |
| FPS™                     | OptoHiT™                                       |                                       |                  |
|                          | OPTOLOGIC®                                     |                                       |                  |

\* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

**DISCLAIMER**

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. TO OBTAIN THE LATEST, MOST UP-TO-DATE DATASHEET AND PRODUCT INFORMATION, VISIT OUR WEBSITE AT [HTTP://WWW.FAIRCHILDSEMI.COM](http://www.fairchildsemi.com). FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

**AUTHORIZED USE**

Unless otherwise specified in this data sheet, this product is a standard commercial product and is not intended for use in applications that require extraordinary levels of quality and reliability. This product may not be used in the following applications, unless specifically approved in writing by a Fairchild officer: (1) automotive or other transportation, (2) military/aerospace, (3) any safety critical application – including life critical medical equipment – where the failure of the Fairchild product reasonably would be expected to result in personal injury, death or property damage. Customer's use of this product is subject to agreement of this Authorized Use policy. In the event of an unauthorized use of Fairchild's product, Fairchild accepts no liability in the event of product failure. In other respects, this product shall be subject to Fairchild's Worldwide Terms and Conditions of Sale, unless a separate agreement has been signed by both Parties.

**ANTI-COUNTERFEITING POLICY**

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, [www.fairchildsemi.com](http://www.fairchildsemi.com), under Terms of Use

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

**PRODUCT STATUS DEFINITIONS**

**Definition of Terms**

| Datasheet Identification | Product Status        | Definition  |
|--------------------------|-----------------------|---|
| Advance Information      | Formative / In Design | Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.   |
| Preliminary              | First Production      | Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design. |
| No Identification Needed | Full Production       | Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.   |
| Obsolete                 | Not In Production     | Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.  |

Rev. I77