



# FSA8029

## Audio Jack Send / End Detection with MIC / Video Switch

### Features

|                       |  |
|-----------------------|--|
| Detection             | Accessory Plug-In<br>3- or 4-Pole Audio Jack<br>Send / End Key Pressed |
| Switch Type           | Microphone & Video   |
| V <sub>DD</sub>       | 2.5 to 4.3V  |
| THD (MIC)             | 0.01% Typical  |
| ESD (Air Gap)         | 16kV   |
| Operating Temperature | -40°C to 85°C  |
| Package               | 10-Lead UMLP<br>1.4x1.8x0.5mm, 0.4mm Pitch                             |
| Top Mark              | KS   |
| Ordering Information  | FSA8029UMX   |

### Description

The FSA8029 is an audio jack microphone / video switch for 3- or 4-pole accessories with send / end (S/E) detection. In addition to detection, the FSA8029 features an integrated microphone / video switch that allows the processor to configure the audio jack. The architecture is designed to allow common third-party headphones to be used for listening to music from mobile handsets, personal media players, and portable peripheral devices.

- Determines when Send / End Button Key is Pressed
- Integrates a MIC / Video Switch for 4-Pole Configuration
- Reduces Pop / Click Caused by Microphone Bias

### Related Resources

- For samples and questions, please contact: [Analog.Switch@fairchildsemi.com](mailto:Analog.Switch@fairchildsemi.com).
- FSA8029 Demonstration Board

### Applications

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

### Typical Application

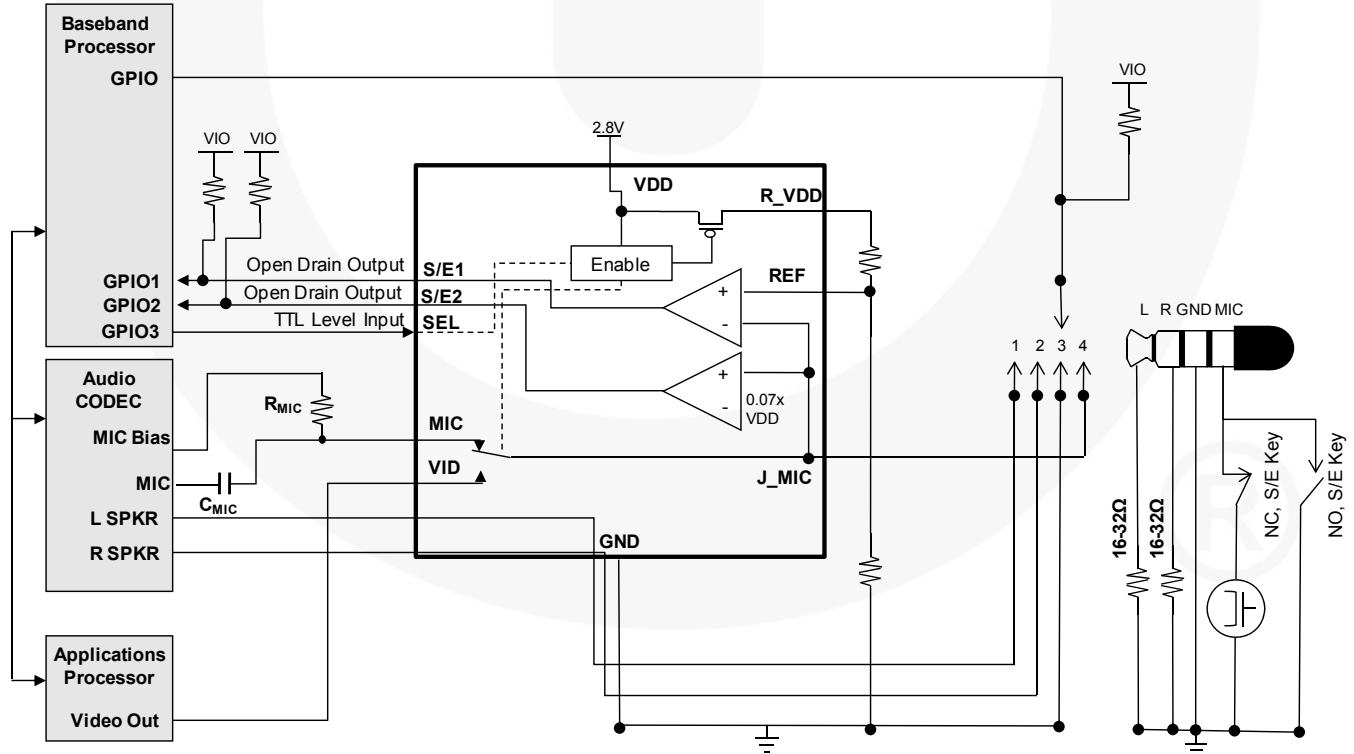


Figure 1. Mobile Phone Example

## Pin Configuration

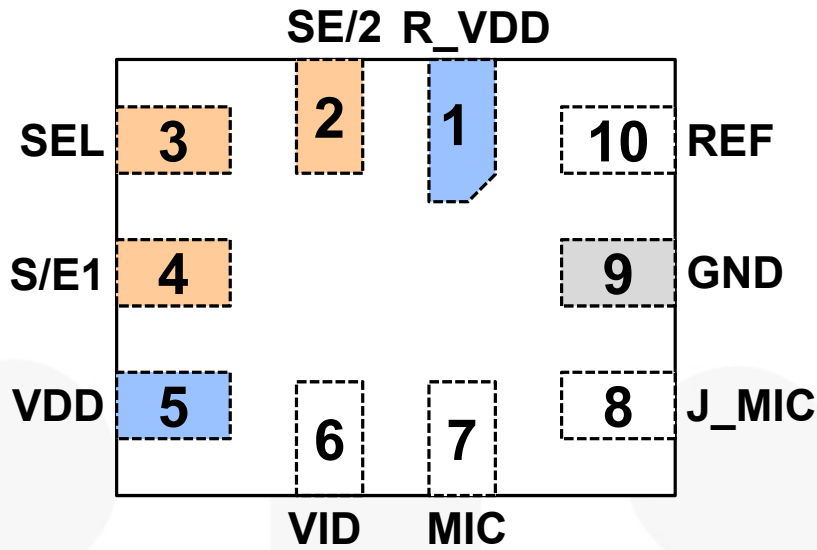


Figure 2. Pin Assignments (Through View)

## Pin Descriptions

| Name  | Pin # | Type   | Description  |                             |
|-------|-------|--------|--|-----------------------------|
| R_VDD | 1     | Output | Optional pull-up voltage, with a resistor divider, sets the reference voltage on the REF pin                               |                             |
| S/E2  | 2     | Output | Indicates state of normally open (N/O) send / end key press; open-drain output requires pull-up resistor                   |                             |
| SEL   | 3     | Input  | 0  | Key Press <sup>(1)</sup>    |
|       |       |        | 1  | No Key Press <sup>(1)</sup> |
| S/E1  | 4     | Output | 0  | VID = J_MIC <sup>(1)</sup>  |
|       |       |        | 1  | MIC = J_MIC <sup>(1)</sup>  |
| VID   | 6     | Switch | Video switch path; connects between video source and audio jack microphone pin   |                             |
| MIC   | 7     | Switch | Microphone switch path to the CODEC microphone amplifier input   |                             |
| J_MIC | 8     | Switch | Microphone switch path connects to the microphone, send / end key, and video of the jack pole                              |                             |
| REF   | 10    | Input  | Reference voltage used to detect a send / end key press through a resistor divider off R_VDD or external voltage reference |                             |
| VDD   | 5     | Power  | Supply voltage   |                             |
| GND   | 9     | Ground | Ground for both the audio jack and PCB   |                             |

**Note:**

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

Table 1. Device Configuration in Reset and Active States

| SEL | MIC   | VID   | R_VDD | S/E1 + S/E2 |
|-----|-------|-------|-------|-------------|
| 1   | J_MIC | Open  | VDD   | Active      |
| 0   | Open  | J_MIC | GND   | HIGH        |

## 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 <sub>DD</sub>  | Supply Voltage from Battery                    |   | -0.5 | 5.5                  | V     |
| V <sub>SW</sub>  | Switch I/O Voltage                             |   | -0.5 | V <sub>DD</sub> +0.5 | V     |
| I <sub>IK</sub>  | Input Clamp Diode Current <sup>(2)</sup>       |   | -50  |                      | mA    |
| I <sub>SW</sub>  | Switch I/O Current (Continuous) <sup>(2)</sup> |   |      | 50                   | mA    |
| T <sub>STG</sub> | Storage Temperature Range                      |   | -65  | +150                 | °C    |
| T <sub>J</sub>   | Maximum Junction Temperature                   |   |      | +150                 | °C    |
| T <sub>L</sub>   | Lead Temperature (Soldering, 10 Seconds)       |   |      | +260                 | °C    |
| ESD              | IEC 61000-4-2 System ESD                       | Air Gap   | 16   |                      | kV    |
|                  |  | Contact   | 10   |                      |       |
|                  | Human Body Model, JEDEC JESD22-A114            | All other Pins  | 5    |                      |       |
|                  |  | J_DET, J_MIC, V <sub>DD</sub> , V <sub>IO</sub> , GND | 8    |                      |       |
|                  | Charged Device Model, JEDEC JESD22-C101        | All Pins  | 2    |                      |       |

### Note:

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

## Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

| Symbol          | Parameter              | Min. | Max. | Units |
|-----------------|------------------------|------|------|-------|
| V <sub>DD</sub> | Battery Supply Voltage | 2.5  | 4.3  | V     |
| T <sub>A</sub>  | Operating Temperature  | -40  | +85  | °C    |

## DC Electrical Characteristics

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

### MIC Switch

| Symbol         | Parameter                            | Conditions  | $V_{DD}$ (V) | $T_A = -40$ to $+85^\circ\text{C}$ |      |          | Units    |
|----------------|--------------------------------------|---|--------------|------------------------------------|------|----------|----------|
|                |                                      |   |              | Min.                               | Typ. | Max.     |          |
| $R_{ON}$       | MIC Switch On Resistance             | $I_{OUT} = 24\text{mA}$ , $V_{IN} = 2.2\text{V}$      | 2.8          |                                    | 2.0  | 4.0      | $\Omega$ |
|                |                                      |   | 3.0          |                                    | 1.5  | 3.5      |          |
|                |                                      |   | 3.3          |                                    | 1.2  | 3.0      |          |
|                |                                      |   | 3.8          |                                    | 1.0  | 2.5      |          |
| $R_{FLAT(ON)}$ | On Resistance Flatness               | $I_{OUT} = 24\text{mA}$ ,<br>$V_{IN} = V$ to $V_{DD}$ | 2.8          |                                    | 0.7  | 1.5      | $\Omega$ |
|                |                                      |   | 3.0          |                                    | 0.6  | 1.4      |          |
|                |                                      |   | 3.3          |                                    | 0.5  | 1.3      |          |
|                |                                      |   | 3.8          |                                    | 0.5  | 1.2      |          |
| $V_{IN}$       | Switch Input Voltage Range           |   | 2.5 to 4.3   | 0                                  |      | $V_{DD}$ | V        |
| $C_{ON}$       | MIC and J_MIC Switch ON Capacitance  | $f = 1\text{MHz}$                                     | 2.8          |                                    | 15   |          | pF       |
| $C_{OFF}$      | MIC and J_MIC Switch OFF Capacitance | $f = 1\text{MHz}$                                     | 2.8          |                                    | 8    |          | pF       |

### Video Switch Characteristics

| Symbol         | Parameter                  | Conditions   | $V_{DD}$ (V) | $T_A = -40$ to $+85^\circ\text{C}$ |      |      | Unit     |
|----------------|----------------------------|--|--------------|------------------------------------|------|------|----------|
|                |                            |  |              | Min.                               | Typ. | Max. |          |
| $R_{ON}$       | MIC Switch On Resistance   | $I_{OUT} = 24\text{mA}$ , $V_{IN} = 0.5\text{V}$                   | 2.8          |                                    | 1.0  | 1.5  | $\Omega$ |
|                |                            |  | 3.0          |                                    | 0.9  | 1.4  |          |
|                |                            |  | 3.3          |                                    | 0.8  | 1.3  |          |
|                |                            |  | 3.8          |                                    | 0.7  | 1.2  |          |
| $R_{FLAT(ON)}$ | On Resistance Flatness     | $I_{OUT} = 24\text{mA}$ ,<br>$V_{IN} = 0\text{V}$ to $1.2\text{V}$ | 2.8          |                                    | 0.4  | 0.60 | $\Omega$ |
|                |                            |  | 3.0          |                                    | 0.3  | 0.55 |          |
|                |                            |  | 3.3          |                                    | 0.2  | 0.50 |          |
|                |                            |  | 3.8          |                                    | 0.15 | 0.45 |          |
| $V_{IN}$       | Switch Input Voltage Range |  | 2.5 to 4.3   | 0                                  |      | 1.5  | V        |
| $C_{ON}$       | VID Switch On Capacitance  | $f = 1\text{MHz}$  | 2.8          |                                    | 40   |      | pF       |
| $C_{OFF}$      | VID Switch Off Capacitance | $f = 1\text{MHz}$  | 2.8          |                                    | 10   |      | pF       |

### Parallel I/O

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

Continued on the following page...

**DC Electrical Characteristics** (Continued)All typical values are at  $T_A = 25^\circ\text{C}$  unless otherwise specified.**Comparator NC Switch**

| Symbol      | Parameter                             | $T_A = -40$ to $+85^\circ\text{C}$ |      |                  | Unit |
|-------------|---------------------------------------|------------------------------------|------|------------------|------|
|             |                                       | Min.                               | Typ. | Max.             |      |
| $V_{REF}$   | Input Voltage on REF Pin              | 1                                  |      | $V_{DD} - 0.075$ | V    |
| $COM_{HYS}$ | Hysteresis of Comparator “-” Terminal |                                    | 50   |                  | mV   |

**Comparator NO Switch**

| Symbol      | Parameter                                   | $V_{DD}$ (V) | $T_A = -40$ to $+85^\circ\text{C}$ |                      |      | Unit |
|-------------|---|--------------|------------------------------------|----------------------|------|------|
|             |   |              | Min.                               | Typ.                 | Max. |      |
| $V_{COMP}$  | Comparator Threshold for Send / End Sensing | 2.5 to 4.3   |                                    | $0.07 \times V_{DD}$ |      | V    |
| $COM_{HYS}$ | Hysteresis of Comparator “+” Terminal       |              |                                    | 50                   |      | mV   |

**Current**

| Symbol       | Parameter                      | Conditions   | $V_{DD}$ (V) | $T_A = -40$ to $+85^\circ\text{C}$ |      |      | Unit          |
|--------------|--------------------------------|--|--------------|------------------------------------|------|------|---------------|
|              |                                |  |              | Min.                               | Typ. | Max. |               |
| $I_{OFF}$    | Off-State Leakage Current      | $J_{MIC} = 1V, 4.3V,$<br>$MIC$ or $VID = 4.3V, 1V$ | 4.3          | -15                                |      | 15   | nA            |
| $I_{IN}$     | Input Leakage Current          | Inputs 0 to 4.3V                                   | 0 to 4.3     |                                    |      | 1    | $\mu\text{A}$ |
| $I_{CC-EN}$  | Low-Power Mode                 | EN = LOW   | 2.5 to 4.3   |                                    | 10   |      | nA            |
| $I_{CC-VID}$ | Current During Video Mode      | Active Current,<br>SEL = LOW                       | 2.5 to 4.3   |                                    | 10   |      | nA            |
| $I_{CC-MIC}$ | Current During Microphone Mode | Active Current,<br>SEL = HIGH                      | 2.5 to 4.3   |                                    | 20   |      | $\mu\text{A}$ |

## AC Electrical Characteristics

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

### MIC Switch

| Symbol     | Parameter                 | Conditions  | $V_{DD}$ (V) | $T_A = -40$ to $+85^\circ C$ |      |      | Unit |
|------------|---------------------------|---|--------------|------------------------------|------|------|------|
|            |                           |   |              | Min.                         | Typ. | Max. |      |
| THD        | Total Harmonic Distortion | $R_T = 600\Omega$ , $V_{SW} = 0.5V_{PP}$ ,<br>$f = 20Hz$ to $20kHz$ , $V_{IN} = 2.2V$ | 2.8          |                              | .003 |      | %    |
| $O_{IRR}$  | Off Isolation             | $f = 20kHz$ , $R_S = 32\Omega$ , $C_L = 0pF$ ,<br>$R_T = 32\Omega$                    | 2.8          |                              | -100 |      | dB   |
| $X_{TALK}$ | Crosstalk from MIC to VID | $f = 1MHz$ , $R_L = 100\Omega$  | 2.8          |                              | -67  |      | dB   |

### Video Switch Characteristics

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

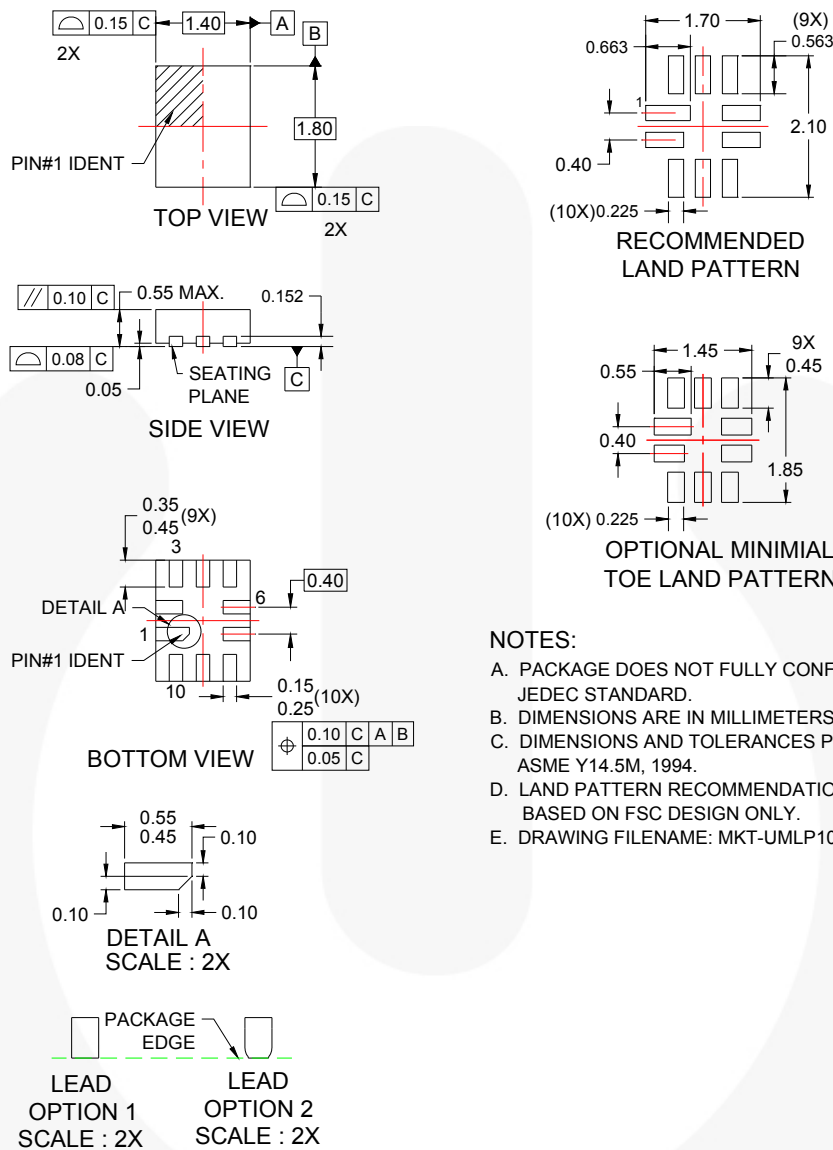
### Parallel I/O

| Symbol            | Parameter   | Conditions   | $V_{DD}$ (V) | $T_A = -40$ to $+85^\circ C$ |      |      | Unit    |
|-------------------|---|--|--------------|------------------------------|------|------|---------|
|                   |   |  |              | Min.                         | Typ. | Max. |         |
| $t_{BBM}$         | Break-Before-Make Time  |  | 2.5 to 4.3   |                              | 120  |      | ns      |
| $t_{SEL-COM-ON}$  | Select to Comparator On                                       | SEL LOW $\rightarrow$ HIGH to<br>Comparator On   | 2.5 to 4.3   |                              | 10   |      | $\mu s$ |
| $t_{SEL-COM-OFF}$ | Select to Comparator Off                                      | SEL HIGH $\rightarrow$ LOW to<br>Comparator Off  | 2.5 to 4.3   |                              | 20   |      | ns      |
| $t_{ON}$          | Switch Turn-On Time   |  | 2.5 to 4.3   |                              | 40   |      | ns      |
| $t_{OFF}$         | Switch Turn-Off Time  |  | 2.5 to 4.3   |                              | 15   |      | ns      |
| $t_{J\_MIC-S/E}$  | Propagation Delay from<br>Comparator Trigger to S/E<br>Output | $J\_MIC > REF$ from LOW $\rightarrow$ HIGH<br>$J\_MIC < REF$ from HIGH $\rightarrow$ LOW | 2.5 to 4.3   |                              | 10   |      | $\mu s$ |

### Power

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

## Physical Dimensions



**Figure 3. 10-Lead, UMLP Package**

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

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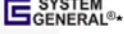
## Ordering Information

| Part Number | Operating Temperature Range | Top Mark | Package   |
|-------------|-----------------------------|----------|---|
| FSA8029UMX  | -40 to +85°C                | KS       | 10-Lead 1.4 x 1.8 x 0.55mm, 0.4mm Pitch, Ultrathin Molded Leadless Package (UMLP) |



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| Datasheet Identification | Product Status        | Definition  |
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