

**FSA1256 • FSA1256A • FSA1257 • FSA1257A •
FSA1258 • FSA1258A**
**Low R_{ON} Low Voltage Dual SPST Analog Switch
with Low I_{CCT} “A” Option**

General Description

The FSA1256, FSA1256A, FSA1257, FSA1257A, FSA1258, and FSA1258A are high performance dual Single Pole/Single Throw (SPST) analog switches. All devices feature ultra low R_{ON} of 1.1 Ω maximum at 4.5V V_{CC} . The FSA1256, FSA1257, and FSA1258 operate over a wide V_{CC} range of 1.65V to 5.5V. The FSA1256A, FSA1257A, and FSA1258A operation range is 2.7V to 5.5V. These devices are fabricated with sub-micron CMOS technology to achieve fast switching speeds and are designed for break-before-make operation. The select input is TTL level compatible. The FSA1256 and FSA1256A feature two Normally Open (NO) switches. The FSA1257 and FSA1257A feature two Normally Closed (NC) switches. The FSA1258 and FSA1258A have one NO switch and one NC switch.

Features

- FSA1256A, FSA1257A, FSA1258A feature low I_{CCT} when S Input is lower than V_{CC}
- Maximum 1.1 Ω On Resistance (R_{ON}) for 4.5V supply
- 0.4 Ω max R_{ON} flatness for 4.5V supply
- Space saving Pb-Free MicroPak™ packaging
- Broad V_{CC} operating range:
 - FSA1256, FSA1257, FSA1258: 1.65V to 5.5V
 - FSA1256A, FSA1257A, FSA1258A: 2.7V to 5.5V
- Fast turn-on and turn-off time
- FSA1258, FSA1258A feature break-before-make enable circuitry
- Over-voltage tolerant TTL compatible control input

Ordering Code:

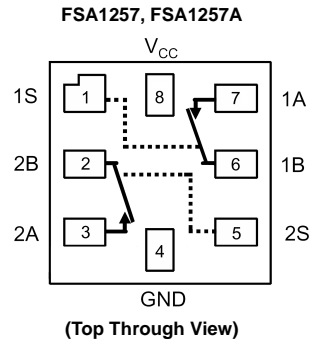
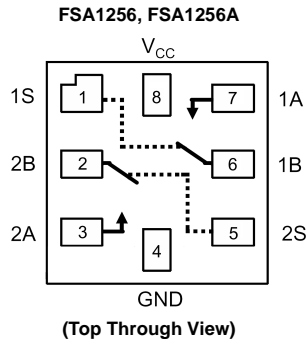
| Order Number | Package Number | Product Code Top Mark | Package Description | Supplied As |
|--------------|----------------|-----------------------|--------------------------------------|---------------------------|
| FSA1256L8X | MAC08A | EB | Pb-Free 8-Lead MicroPak, 1.6 mm Wide | 5K Units on Tape and Reel |
| FSA1256AL8X | MAC08A | FN | Pb-Free 8-Lead MicroPak, 1.6 mm Wide | 5K Units on Tape and Reel |
| FSA1257L8X | MAC08A | EC | Pb-Free 8-Lead MicroPak, 1.6 mm Wide | 5K Units on Tape and Reel |
| FSA1257AL8X | MAC08A | FP | Pb-Free 8-Lead MicroPak, 1.6 mm Wide | 5K Units on Tape and Reel |
| FSA1258L8X | MAC08A | ED | Pb-Free 8-Lead MicroPak, 1.6 mm Wide | 5K Units on Tape and Reel |
| FSA1258AL8X | MAC08A | FS | Pb-Free 8-Lead MicroPak, 1.6 mm Wide | 5K Units on Tape and Reel |

Pb-Free package per JEDEC J-STD-020B.

MicroPak™ is a trademark of Fairchild Semiconductor Corporation.

FSA1256 • FSA1256A • FSA1257 • FSA1257A • FSA1258 • FSA1258A Low R_{ON} Low Voltage Dual SPST Analog Switch with Low I_{CCT} “A” Option

Analog Symbols



Truth Tables

FSA1256, FSA1256A

| Control Input(s) | Function |
|------------------|------------------|
| L | Disconnect |
| H | A Connected to B |

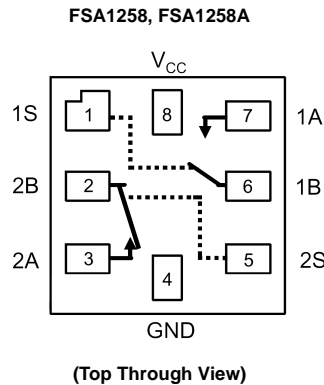
H = HIGH Logic Level

FSA1257, FSA1257A

| Control Input(s) | Function |
|------------------|------------------|
| L | A Connected to B |
| H | Disconnect |

L = LOW Logic Level

Analog Symbol



Truth Table

FSA1258, FSA1258A

| Control Input 1S | Function | Control Input 2S | Function |
|------------------|--------------------|------------------|--------------------|
| L | 1A Connected to 1B | L | Disconnect |
| H | Disconnect | H | 2A Connected to 2B |

H = HIGH Logic Level

L = LOW Logic Level

Pin Descriptions

| Pin Names | Function |
|-----------|---------------|
| A, B | Data Ports |
| S | Control Input |

| Absolute Maximum Ratings ^(Note 1) | | Recommended Operating Conditions | |
|--|--------------------------|---|---|
| Supply Voltage (V_{CC}) | -0.5V to +6.0V | Supply Voltage (V_{CC}) | FSA1256, FSA1257, FSA1258 1.65V to 5.5V |
| Switch Voltage (V_S) (Note 2) | -0.5V to $V_{CC} + 0.5V$ | Supply Voltage (V_{CC}) | FSA1256A, FSA1257A, FSA1258A 2.7V to 5.5V |
| Input Voltage (V_{IN}) (Note 2) | -0.5V to +6.0V | Control Input Voltage (V_{IN}) (Note 3) | 0V to V_{CC} |
| Input Diode Current | -50 mA | Switch Input Voltage (V_{IN}) | 0V to V_{CC} |
| Switch Current | 200 mA | Operating Temperature (T_A) | -40°C to +85°C |
| Peak Switch Current (Pulsed at 1 ms duration, <10% Duty Cycle) | 400 mA | Thermal Resistance (θ_{JA}) in still air | MicroPak 8L package 224°C/W (modeled) |
| Power Dissipation @ 85°C | | | |
| MicroPak 8L package | 180 mW | | |
| Storage Temperature Range (T_{STG}) | -65°C to +150°C | | |
| Maximum Junction Temperature (T_J) | +150°C | | |
| Lead Temperature (T_L) | | | |
| Soldering, 10 seconds | +260°C | | |
| ESD | | | |
| Human Body Model | | | |
| FSA1256, FSA1257, FSA1258 | 5.5kV | | |
| FSA1256A, FSA1257A, FSA1258A | 4.5kV | | |

Note 1: The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

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

Note 3: Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

(All typical values are @ 25°C unless otherwise specified)

| Symbol | Parameter | V_{CC} (V) | $T_A = +25^\circ\text{C}$ | | | $T_A = -40^\circ\text{C to } +85^\circ\text{C}$ | | Units | Conditions |
|--------------------------------|--|-----------------|---------------------------|-----------|-------|---|---------------|---|------------|
| | | | Min | Typ | Max | Min | Max | | |
| V_{IH} | Input Voltage High | 2.7 to 3.6 | | | | 2.0 | V | | |
| | | 4.5 to 5.5 | | | | 2.4 | | | |
| V_{IL} | Input Voltage Low | 2.7 to 3.6 | | | | 0.4 | V | FSA1256A, FSA1257A, FSA1258A Only | |
| | | 2.7 to 3.6 | | | | 0.6 | | | |
| | | 4.5 to 5.5 | | | | 0.8 | | | |
| I_{IN} | Control Input Leakage | 2.7 to 3.6 | | | | -1.0 1.0 | μA | $V_{IN} = 0V \text{ to } V_{CC}$ | |
| | | 4.5 to 5.5 | | | | -1.0 1.0 | | | |
| $I_{NO(OFF)}$ $I_{NC(OFF)}$ | OFF-Leakage Current | 5.5 | -2.0 | 2.0 | -20.0 | 20.0 | nA | A = 1V, 4.5V 1B or 2B = 1V, 4.5V | |
| R_{ON} | Switch On Resistance (Note 4) | 2.7 | | 2.6 4.0 | | 4.3 | Ω | $I_{OUT} = 100 \text{ mA}, 1B \text{ or } 2B = 1.5V$ | |
| | | 4.5 | | 0.95 1.15 | | 1.3 | | $I_{OUT} = 100 \text{ mA}, 1B \text{ or } 2B = 3.5V$ | |
| ΔR_{ON} | On Resistance Matching Between Channels (Note 5) | 4.5 | | 0.06 0.12 | | 0.15 | Ω | $I_{OUT} = 100 \text{ mA}, 1B \text{ or } 2B = 3.5V$ | |
| $R_{FLAT(ON)}$ | On Resistance Flatness (Note 6) | 2.7 | | 1.4 | | | Ω | $I_{OUT} = 100 \text{ mA}, 1B \text{ or } 2B = 0V, 0.75V, 1.5V$ | |
| | | 4.5 | | 0.2 0.3 | | 0.4 | | $I_{OUT} = 100 \text{ mA}, 1B \text{ or } 2B = 0V, 1V, 2V$ | |
| I_{CC} | Quiescent Supply Current | 3.6 | | 0.1 0.5 | | 1.0 | μA | $V_{IN} = 0V \text{ or } V_{CC}, I_{OUT} = 0V$ | |
| | | 5.5 | | 0.1 0.5 | | 1.0 | | | |
| I_{CCT} | Increase in I_{CC} per Input | 4.3 | | 0.2 | | 10.0 | μA | One Input at 2.6V, Others at V_{CC} or GND (FSA1256A, FSA1257A, FSA1258A Only) | |

Note 4: On Resistance is determined by the voltage drop between A and B pins at the indicated current through the switch.

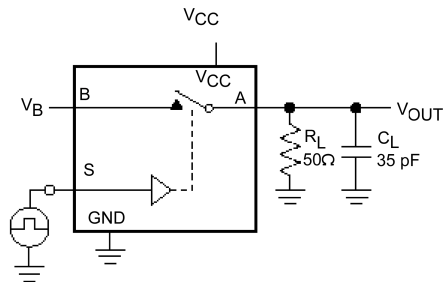
Note 5: $\Delta R_{ON} = R_{ONmax} - R_{ONmin}$ measured at identical V_{CC} , temperature, and voltage.

Note 6: Flatness is defined as the difference between the maximum and minimum value of On Resistance over the specified range of conditions.

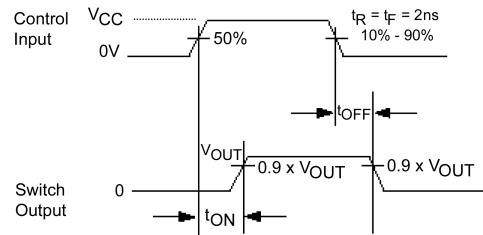
| AC Electrical Characteristics (All typical value are @ 25°C unless otherwise specified) | | | | | | | | | | |
|---|---------------------------|------------------------|------------------------|------|-----|---------------------------------|-----|--|------------|---------------|
| Symbol | Parameter | V _{CC} (V) | T _A = +25°C | | | T _A = -40°C to +85°C | | Units | Conditions | Figure Number |
| | | | Min | Typ | Max | Min | Max | | | |
| t _{ON} | Turn ON Time | 2.7 to 3.6 | 15.0 | 50.0 | | 60.0 | ns | 1B or 2B = 1.5V, R _L = 50Ω, C _L = 35 pF | Figure 1 | |
| | | 4.5 to 5.5 | 10.0 | 35.0 | | 40.0 | | 1B or 2B = 3.0V, R _L = 50Ω, C _L = 35 pF | | |
| t _{OFF} | Turn OFF Time | 2.7 to 3.6 | 8.0 | 20.0 | | 30.0 | ns | 1B or 2B = 1.5V, R _L = 50Ω, C _L = 35 pF | Figure 1 | |
| | | 4.5 to 5.5 | 4.0 | 15.0 | | 20.0 | | 1B or 2B = 3.0V, R _L = 50Ω, C _L = 35 pF | | |
| t _{B-M} | Break-Before-Make Time | 2.7 to 3.6 | 12.0 | | | | ns | 1B or 2B = 1.5V, R _L = 50Ω, C _L = 35 pF | Figure 2 | |
| | | 4.5 to 5.5 | 7.0 | | | | | 1B or 2B = 3.0V, R _L = 50Ω, C _L = 35 pF | | |
| Q | Charge Injection | 2.7 to 3.6 | 10.0 | | | | pC | C _L = 1.0 nF, V _{GEN} = 0V, R _{GEN} = 0Ω | Figure 4 | |
| | | 4.5 to 5.5 | 20.0 | | | | | | | |
| OIRR | OFF-Isolation | 2.7 to 3.6 | -70.0 | | | | dB | f = 1MHz, R _L = 50Ω | Figure 3 | |
| | | 4.5 to 5.5 | -70.0 | | | | | | | |
| Xtalk | Crosstalk | 2.7 to 3.6 | -100 | | | | dB | f = 1MHz, R _L = 50Ω | Figure 6 | |
| | | 4.5 to 5.5 | -100 | | | | | | | |
| BW | -3db Bandwidth | 2.7 to 3.6 | 300 | | | | MHz | R _L = 50Ω | Figure 7 | |
| | | 4.5 to 5.5 | 300 | | | | | | | |
| THD | Total Harmonic Distortion | 2.7 to 3.6 | 0.002 | | | | % | R _L = 600Ω, V _{IN} = 0.5V P.P, f = 20Hz to 20kHz | Figure 8 | |
| | | 4.5 to 5.5 | 0.002 | | | | | | | |

| Capacitance | | | | | | | | | | |
|------------------|-------------------------------|------------------------|------------------------|------|-----|--------------------------------|-----|-------|-------------------------|--|
| Symbol | Parameter | V _{CC} (V) | T _A = +25°C | | | T _A = 40°C to +85°C | | Units | Conditions | |
| | | | Min | Typ | Max | Min | Max | | | |
| C _{IN} | Control Pin Input Capacitance | 0.0 | | 3.0 | | | | pF | f = 1MHz (see Figure 6) | |
| C _{OFF} | B Port OFF Capacitance | 4.5 | | 11.5 | | | | pF | f = 1MHz (see Figure 6) | |
| C _{ON} | A Port ON Capacitance | 4.5 | | 27.0 | | | | pF | f = 1MHz (see Figure 6) | |

AC Loading and Waveforms



C_L includes Fixture and Stray Capacitance



Logic Input Waveforms Inverted for Switches that have the Opposite Logic Sense

FIGURE 1. Turn-On/Turn-Off Timing

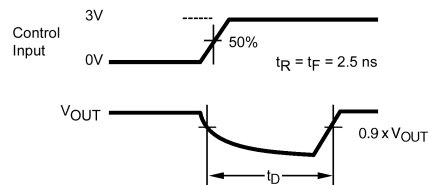
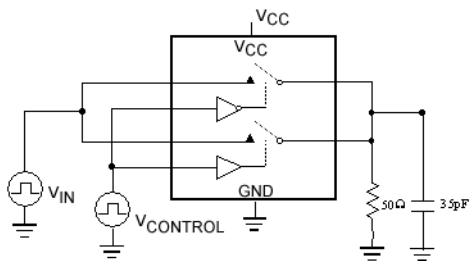
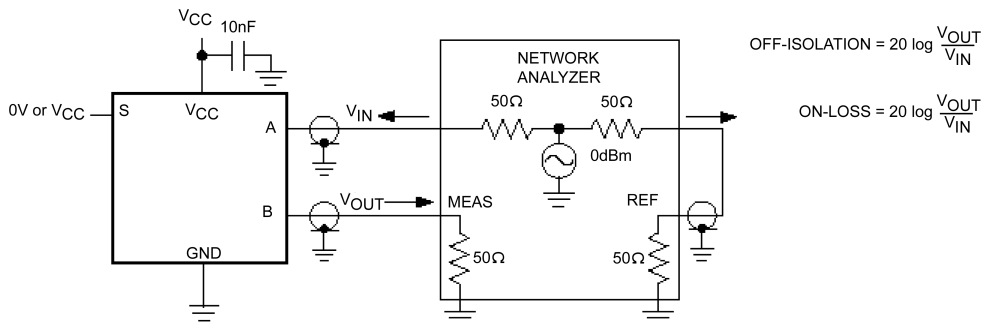


FIGURE 2. Break-Before-Make Timing



$$\text{OFF-ISOLATION} = 20 \log \frac{V_{OUT}}{V_{IN}}$$

$$\text{ON-LOSS} = 20 \log \frac{V_{OUT}}{V_{IN}}$$

FIGURE 3. OFF Isolation

AC Loading and Waveforms (Continued)

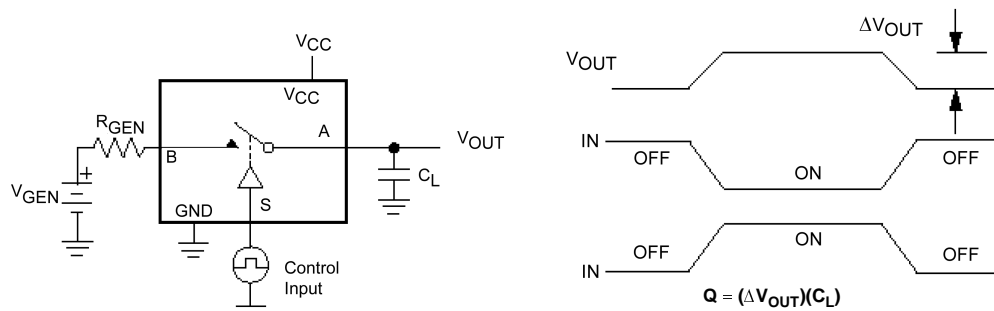


FIGURE 4. Charge Injection

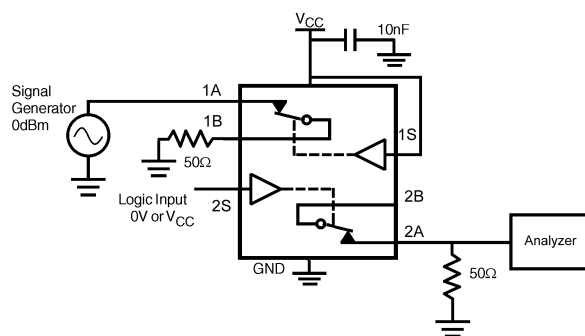


FIGURE 5. Crosstalk

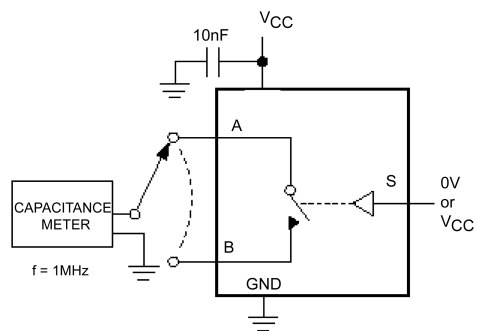


FIGURE 6. ON/OFF Capacitance Measurement Setup

AC Loading and Waveforms (Continued)

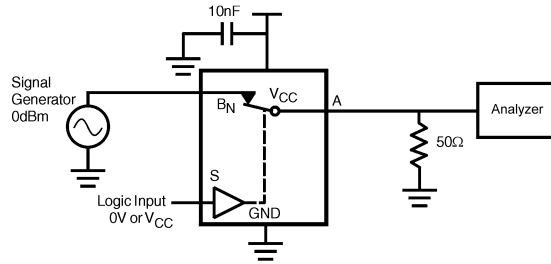


FIGURE 7. Bandwidth

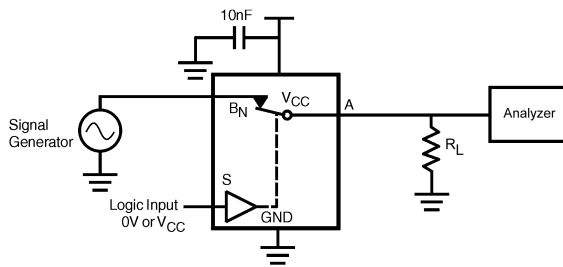


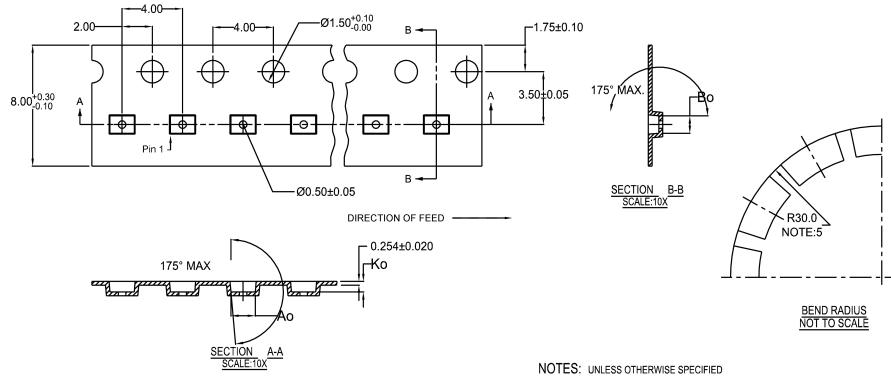
FIGURE 8. Harmonic Distortion

FSA1256 • FSA1256A • FSA1257 • FSA1257A • FSA1258 • FSA1258A

Tape and Reel Specification

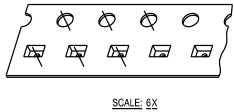
Tape Format For Micropak

| Package Designator | Tape Section | Number Cavities | Cavity Status | Cover Tape Status |
|--------------------|--------------------|-----------------|---------------|-------------------|
| L8X | Leader (Start End) | 125 (typ) | Empty | Sealed |
| | Carrier | 5000 | Filled | Sealed |
| | Trailer (Hub End) | 75 (typ) | Empty | Sealed |

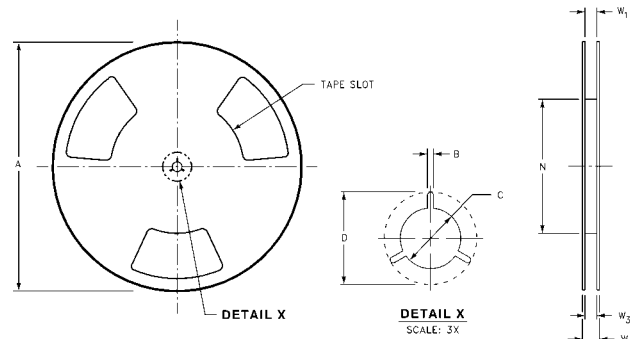


| | | | | |
|----|--------|-----------|-----------|-----------|
| 10 | 300056 | 2.30±0.05 | 1.78±0.05 | 0.68±0.05 |
| 8 | 300038 | 1.78±0.05 | 1.78±0.05 | 0.68±0.05 |
| 6 | 300033 | 1.60±0.05 | 1.15±0.05 | 0.70±0.05 |

- NOTES: UNLESS OTHERWISE SPECIFIED
1. ACCUMULATED 50 SPROCKETS, SPROCKET HOLE PITCH IS 200.00 ±0.30MM
 2. NO INDICATED CORNER RADIUS IS 0.127MM
 3. CAMBER NOT TO EXCEED 1MM IN 100MM
 4. SMALLEST ALLOWABLE BENDING RADIUS
 5. POCKET POSITION RELATIVE TO SPROCKET HOLE MEASURED AS TRUE POSITION OF POCKET, NOT POCKET HOLE

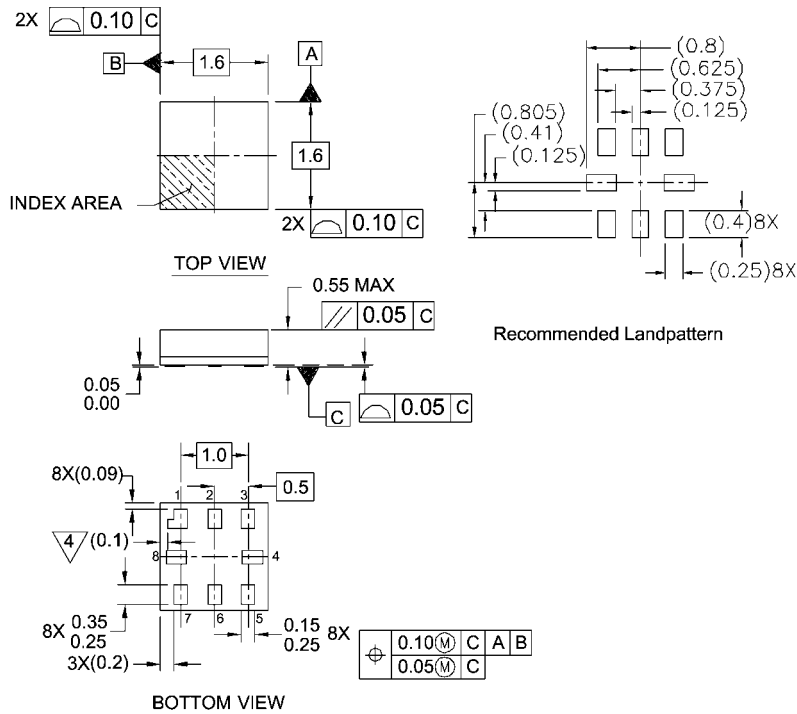


REEL DIMENSIONS inches (millimeters)



| Tape Size | A | B | C | D | N | W1 | W2 | W3 |
|-----------|----------------|-----------------|------------------|------------------|------------------|---|------------------|--|
| 8 mm | 7.0 (177.8) | 0.059 (1.50) | 0.512 (13.00) | 0.795 (20.20) | 2.165 (55.00) | 0.331 + 0.059/-0.000 (8.40 + 1.50/-0.00) | 0.567 (14.40) | W1 + 0.078/-0.039 (W1 + 2.00/-1.00) |

Physical Dimensions inches (millimeters) unless otherwise noted



Notes:

1. PACKAGE CONFORMS TO JEDEC MO-255 VARIATION UAAD
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y.14M-1994
4. PIN 1 FLAG, END OF PACKAGE OFFSET.

MAC08AREVC

**Pb-Free 8-Lead MicroPak, 1.6 mm Wide
Package Number MAC08A**

Fairchild does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and Fairchild reserves the right at any time without notice to change said circuitry and specifications.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

www.fairchildsemi.com