

# FSAV450

## 800MHz 4 Channel 2:1 Video Switch

### General Description

The FSAV450 is a high performance Quad SPDT (2-to-1 multiplexer/demultiplexer) video switch designed specifically for switching high definition YPbPr and computer RGB (up to UXGA) signals. The bandwidth of this device is 800MHz (Typ) which allows signals to pass with minimal edge and phase distortion. Image integrity is maintained with low crosstalk, high OFF-Isolation and low differential gain and phase. The low On Resistance ( $4\Omega$  typical) minimizes signal insertion loss. Low voltage operation (3V), low power consumption (1uA maximum) and small scale packaging (including leadless DQFN) make this device ideal for a broad range of applications.

### Features

- -50dB OFF Isolation at 30MHz
- -80dB non-adjacent channel crosstalk at 30MHz
- $4\Omega$  typical On Resistance ( $R_{ON}$ )
- -3dB bandwidth: 800MHz
- Low power consumption (1uA max)
- Control input: TTL compatible

### Applications

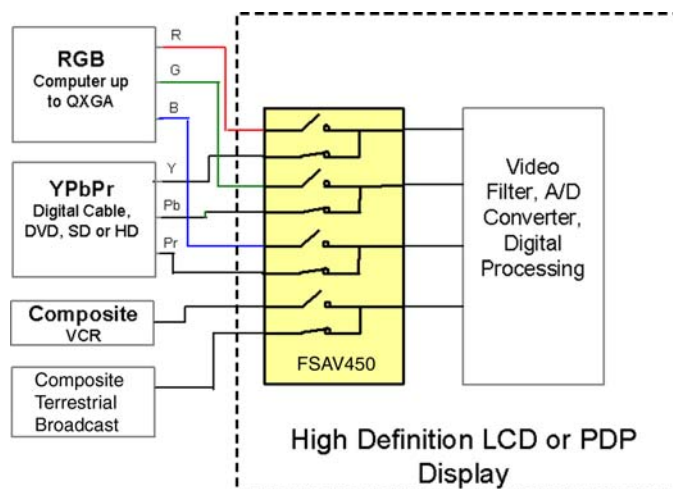
- RGB Video Switch in LCD, plasma and projector displays

### Ordering Code:

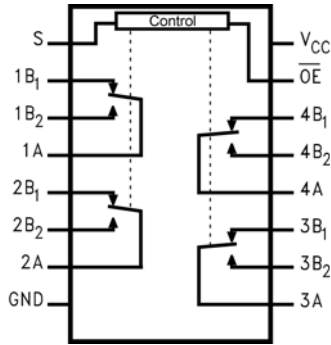
| Order Number        | Package Number | Package Description   |
|---------------------|----------------|---|
| FSAV450BQX (Note 1) | MLP016E        | Pb-Free 16-Terminal Depopulated Quad Very-Thin Flat Pack No Leads (DQFN), JEDEC MO-241, 2.5 x 3.5mm |
| FSAV450QSC          | MQA16A         | 16-Lead Quarter Size Outline Package (QSOP), JEDEC MO-137, 0.150 Wide                               |
| FSAV450MTC          | MTC16          | 16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide                         |

Devices also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering code.  
Pb-Free package per JEDEC J-STD-020B.

**Note 1:** DQFN package available in Tape and Reel only.

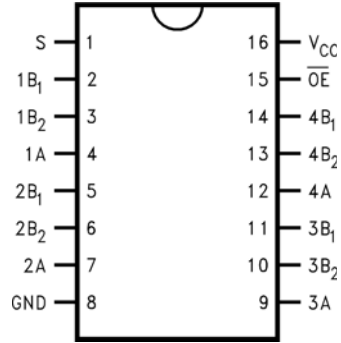


### Analog Symbol

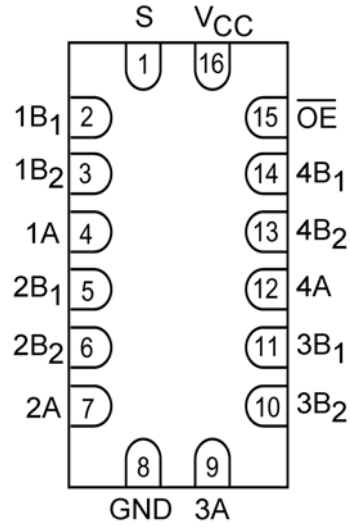


### Connection Diagrams

Pin Assignments for QSOP and TSSOP



Pad Assignments for DQFN (Preliminary)



### Pin Descriptions

| Pin Name                       | Description       |
|--------------------------------|-------------------|
| $\overline{OE}$                | Bus Switch Enable |
| S                              | Select Input      |
| A                              | Bus A             |
| B <sub>1</sub> -B <sub>2</sub> | Bus B             |

### Truth Table

| S | $\overline{OE}$ | Function           |
|---|-----------------|--------------------|
| X | H               | Disconnect         |
| L | L               | A = B <sub>1</sub> |
| H | L               | A = B <sub>2</sub> |

## Absolute Maximum Ratings (Note 2)

|   |                  |
|---|------------------|
| Supply Voltage ( $V_{CC}$ )                       | -0.5V to +6.0V   |
| DC Switch Voltage ( $V_S$ )                       | -0.5V to +6.0V   |
| DC Input Voltage ( $V_{IN}$ ) (Note 3)            | -0.5V to +6.0V   |
| DC Input Diode Current ( $I_{IK}$ ) $V_{IN} < 0V$ | -50 mA           |
| DC Output ( $I_{OUT}$ ) Sink Current              | 128 mA           |
| DC $V_{CC}/GND$ Current ( $I_{CC}/I_{GND}$ )      | $\pm 100$ mA     |
| Storage Temperature Range ( $T_{STG}$ )           | -65°C to +150 °C |
| ESD   |                  |
| Human Body Model                                  | 2kV              |

## Recommended Operating Conditions

(Note 4)

|  |                  |
|--|------------------|
| Power Supply Operating ( $V_{CC}$ )      | 4.5V to 5.5V     |
| Input Voltage ( $V_{IN}$ )               | 0V to $V_{CC}$   |
| Output Voltage ( $V_{OUT}$ )             | 0V to $V_{CC}$   |
| Input Rise and Fall Time ( $t_r, t_f$ )  |                  |
| Switch Control Input                     | 0 ns/V to 5 ns/V |
| Switch I/O                               | 0 ns/V to DC     |
| Free Air Operating Temperature ( $T_A$ ) | -40 °C to +85 °C |

**Note 2:** 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 rating. The Recommended Operating Conditions tables will define the conditions for actual device operation.

**Note 3:** The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.

**Note 4:** Unused control inputs must be held HIGH or LOW. They may not float.

## DC Electrical Characteristics

| Symbol          | Parameter                        | $V_{CC}$<br>(V) | $T_A = -40\text{ }^\circ\text{C to }+85\text{ }^\circ\text{C}$ |                 |           | Units         | Conditions   |
|-----------------|----------------------------------|-----------------|--|-----------------|-----------|---------------|--|
|                 |                                  |                 | Min  | Typ<br>(Note 5) | Max       |               |  |
|                 | Analog Signal Range              |                 | 0  |                 | 2.0       | V             |  |
| $V_{IK}$        | Clamp Diode Voltage              | 4.5             |  |                 | -1.2      | V             | $I_{IN} = -18\text{ mA}$                                     |
| $V_{IH}$        | HIGH Level Input Voltage         | 4.5 to 5.5      | 2.0  |                 |           | V             |  |
| $V_{IL}$        | LOW Level Input Voltage          | 4.5 to 5.5      |  |                 | 0.8       | V             |  |
| $I_I$           | Input Leakage Current            | 5.5             |  |                 | $\pm 1.0$ | $\mu\text{A}$ | $0 \leq V_{IN} \leq 5.5V$                                    |
| $I_{OFF}$       | OFF-STATE Leakage Current        | 5.5             |  |                 | $\pm 1.0$ | $\mu\text{A}$ | $0 \leq A, B \leq V_{CC}$                                    |
| $R_{ON}$        | Switch On Resistance<br>(Note 6) | 4.5             |  | 4.0             | 6.0       | $\Omega$      | $V_{IN} = 1.0V$<br>$R_I = 75\ \Omega, I_{ON} = 13\text{ mA}$ |
|                 |                                  | 4.5             |  | 5.0             | 7.0       | $\Omega$      | $V_{IN} = 2.0V$<br>$R_I = 75\ \Omega, I_{ON} = 26\text{ mA}$ |
| $I_{CC}$        | Quiescent Supply Current         | 5.5             |  |                 | 1.0       | $\mu\text{A}$ | $V_{IN} = V_{CC}$ or GND, $I_{OUT} = 0$                      |
| $\Delta I_{CC}$ | Increase in $I_{CC}$ per Input   | 5.5             |  |                 | 1.5       | mA            | One Input at 3.4V<br>Other Inputs at $V_{CC}$ or GND         |

**Note 5:** Typical values are at  $T_A = +25^\circ\text{C}$

**Note 6:** Measured by the voltage drop between A and B pins at the indicated current through the switch. On Resistance is determined by the lower of the voltages on the two (A or B) pins.

## AC Electrical Characteristics

| Symbol            | Parameter                        | V <sub>CC</sub> (V) | T <sub>A</sub> = -40°C to +85°C |              |     | Units  | Conditions                            | Figure Number |
|-------------------|----------------------------------|---------------------|---------------------------------|--------------|-----|--------|---------------------------------------|---------------|
|                   |                                  |                     | Min                             | Typ (Note 7) | Max |        |                                       |               |
| t <sub>ON</sub>   | Turn ON Time S-to-Bus B          | 4.5 to 5.5          |                                 | 4.0          | 6.0 | ns     | V <sub>B</sub> = 2.0V                 | Figures 8, 9  |
|                   | Output Enable Time OE-to-A or B  | 4.5 to 5.5          |                                 | 3.5          | 5.5 |        |                                       |               |
| t <sub>OFF</sub>  | Turn OFF Time S-to-Bus B         | 4.5 to 5.5          |                                 | 1.5          | 3.5 | ns     | V <sub>B</sub> = 2.0V                 | Figures 8, 9  |
|                   | Output Disable Time OE-to-A or B | 4.5 to 5.5          |                                 | 1.5          | 3.5 |        |                                       |               |
| DG                | Differential Gain                | 4.5 to 5.5          |                                 | 0.2          |     | %      | R <sub>L</sub> = 75Ω, f = 3.58MHz     | Figure 2      |
| DP                | Differential Phase               | 4.5 to 5.5          |                                 | 0.1          |     | Degree | R <sub>L</sub> = 75Ω, f = 3.58MHz     | Figure 3      |
| O <sub>IRR</sub>  | Non-Adjacent OFF-Isolation       | 4.5 to 5.5          |                                 | -50.0        |     | dB     | f = 30MHz, R <sub>L</sub> = 75Ω       | Figures 4, 10 |
| X <sub>TALK</sub> | Non-Adjacent Channel Crosstalk   | 4.5 to 5.5          |                                 | -80.0        |     | dB     | R <sub>L</sub> = 75Ω, f = 30MHz       | Figures 5, 11 |
| BW                | -3dB Bandwidth                   | 4.5 to 5.5          |                                 | 800          |     | MHz    | R <sub>L</sub> = 50Ω (DQFN)           | Figures 1, 12 |
|                   |                                  | 4.5 to 5.5          |                                 | 700          |     |        | R <sub>L</sub> = 50Ω (QSOP and TSSOP) |               |
|                   |                                  | 4.5 to 5.5          |                                 | 650          |     |        | R <sub>L</sub> = 75Ω (DQFN)           |               |
|                   |                                  | 4.5 to 5.5          |                                 | 600          |     |        | R <sub>L</sub> = 75Ω (QSOP and TSSOP) |               |

Note 7: Typical values are at V<sub>CC</sub> = 5.0V and T<sub>A</sub> = +25°C

## Capacitance

| Symbol           | Parameter                     | T <sub>A</sub> = -40°C to +85°C | Units | Conditions                                   |
|------------------|-------------------------------|---------------------------------|-------|--|
|                  |                               | Typ                             |       |  |
| C <sub>IN</sub>  | Control Pin Input Capacitance | 3.0                             | pF    | V <sub>CC</sub> = 0V                         |
| C <sub>ON</sub>  | A/B ON Capacitance            | 8.5                             | pF    | V <sub>CC</sub> = 5.0V, $\overline{OE}$ = 0V |
| C <sub>OFF</sub> | Port B OFF Capacitance        | 3.0                             | pF    | V <sub>CC</sub> and $\overline{OE}$ = 5.0V   |

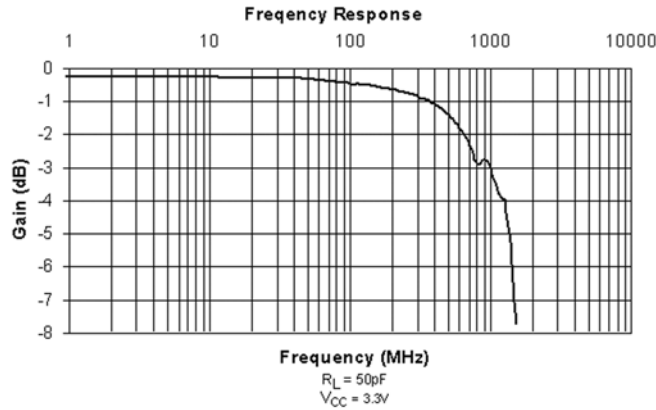


FIGURE 1. Gain vs. Frequency

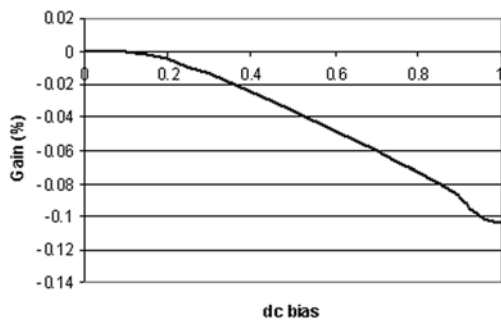


FIGURE 2. Differential Gain vs. dc bias

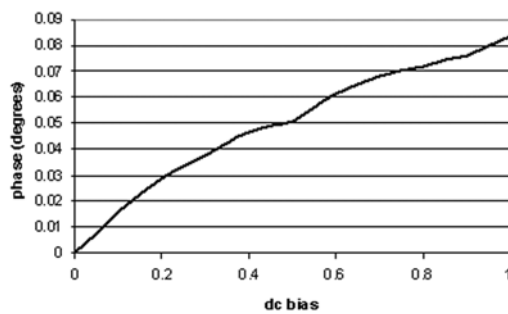


FIGURE 3. Differential Phase vs. dc bias

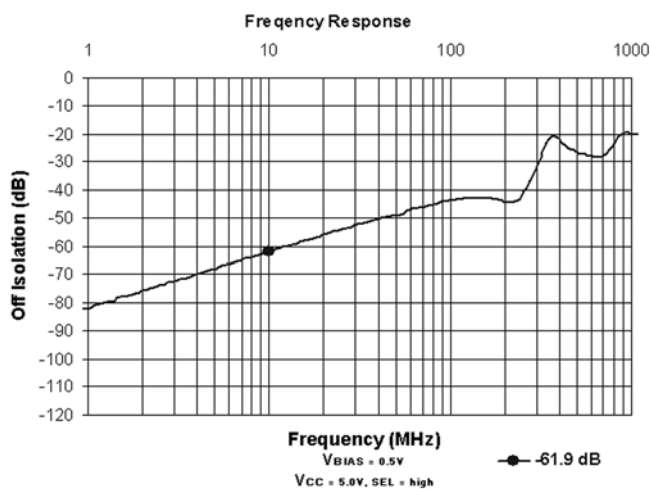


FIGURE 4. OFF Isolation

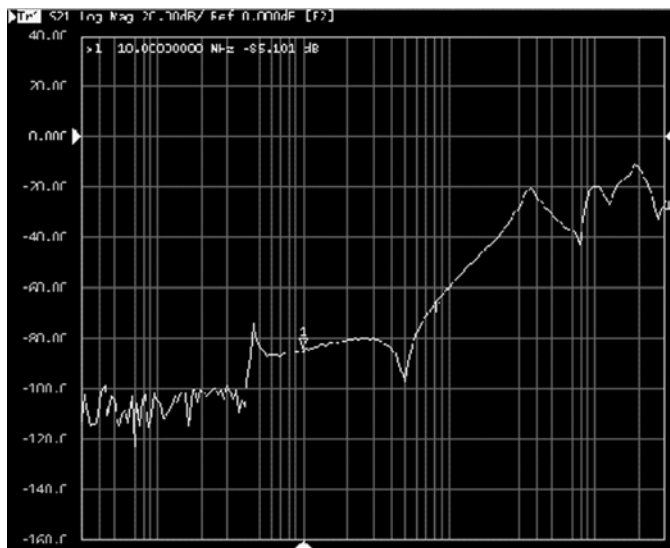


FIGURE 5. OFF Crosstalk vs. Frequency

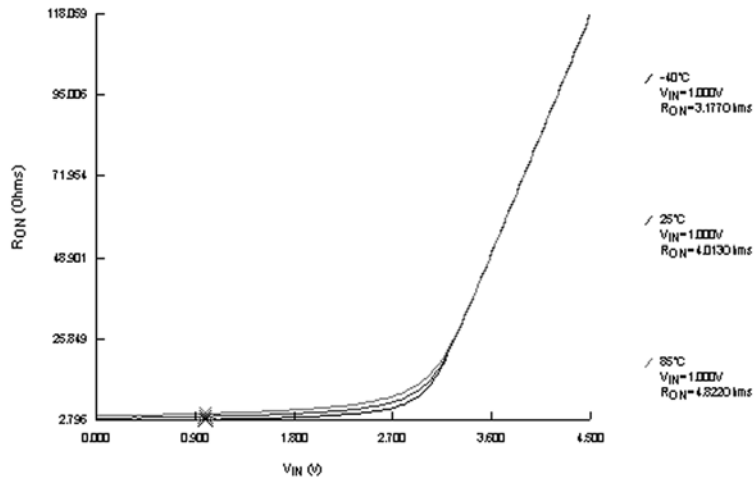


FIGURE 6.  $R_{ON}$  Switch On Resistance,  $I_{ON} = 13\text{mA}$

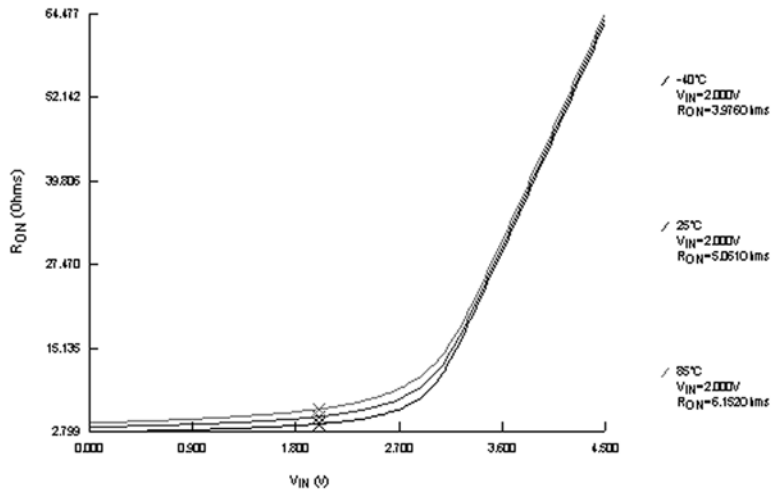
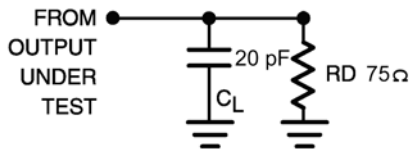


FIGURE 7.  $R_{ON}$  Switch On Resistance,  $I_{ON} = 26\text{mA}$

## AC Loading and Waveforms



Note: Input driven by 50 Ω source terminated in 50 Ω

Note:  $C_L$  includes load and stray capacitance

Note: Input PRR = 1.0 MHz,  $t_{IV} = 500$  ns

FIGURE 8. AC Test Circuit

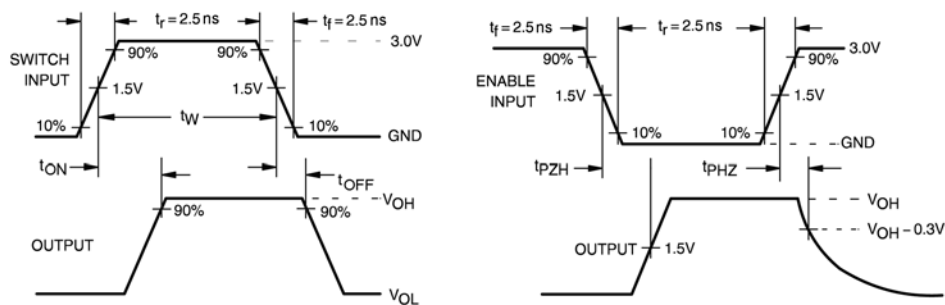


FIGURE 9. AC Waveforms

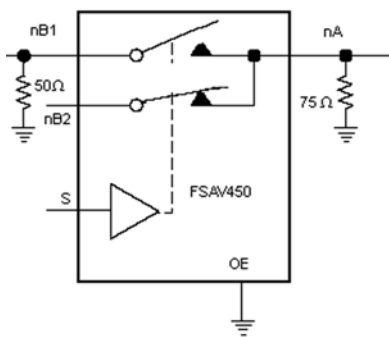


FIGURE 10. OFF Isolation Test

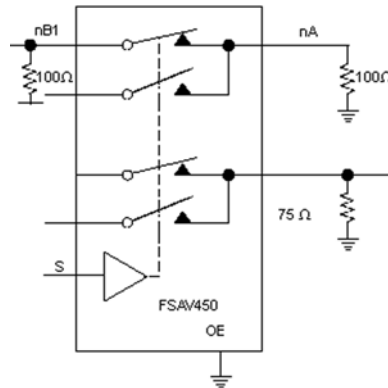


FIGURE 11. Crosstalk Test

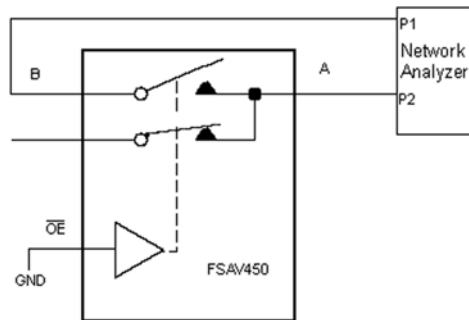


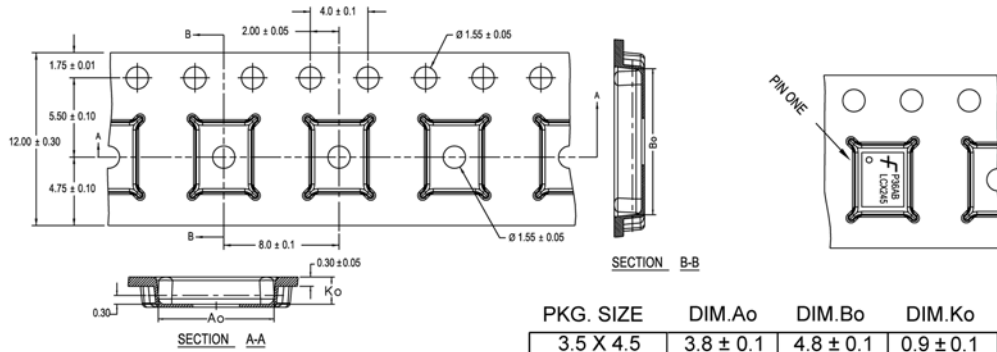
FIGURE 12. Bandwidth Test

## Tape and Reel Specification

TAPE FORMAT for DQFN

| Package Designator | Tape Section       | Number Cavities | Cavity Status | Cover Tape Status |
|--------------------|--------------------|-----------------|---------------|-------------------|
| BQX                | Leader (Start End) | 125 (typ)       | Empty         | Sealed            |
|                    | Carrier            | 2500/3000       | Filled        | Sealed            |
|                    | Trailer (Hub End)  | 75 (typ)        | Empty         | Sealed            |

TAPE DIMENSIONS inches (millimeters)



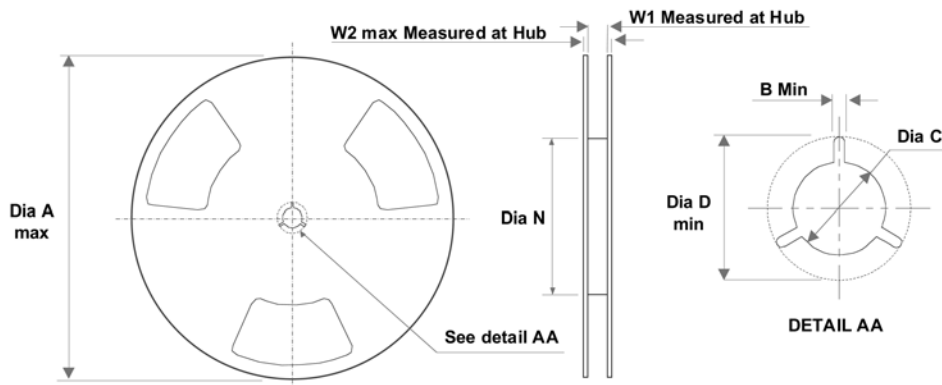
| PKG. SIZE | DIM.Ao    | DIM.Bo    | DIM.Ko    |
|-----------|-----------|-----------|-----------|
| 3.5 X 4.5 | 3.8 ± 0.1 | 4.8 ± 0.1 | 0.9 ± 0.1 |
| 3.0 X 3.0 | 3.3 ± 0.1 | 3.3 ± 0.1 | 0.9 ± 0.1 |
| 2.5 X 4.5 | 2.8 ± 0.1 | 4.8 ± 0.1 | 0.9 ± 0.1 |
| 2.5 X 3.5 | 2.8 ± 0.1 | 3.8 ± 0.1 | 0.9 ± 0.1 |
| 2.5 X 3.0 | 2.8 ± 0.1 | 3.3 ± 0.1 | 0.9 ± 0.1 |
| 2.5 X 2.5 | 2.8 ± 0.1 | 2.8 ± 0.1 | 0.9 ± 0.1 |

DIMENSIONS ARE IN MILLIMETERS

NOTES: unless otherwise specified

1. Cumulative pitch for feeding holes and cavities (chip pockets) not to exceed 0.008[0.20] over 10 pitch span.
2. Smallest allowable bending radius.
3. Thru hole inside cavity is centered within cavity.
4. Tolerance is ±0.002[0.05] for these dimensions on all 12mm tapes.
5. Ao and Bo measured on a plane 0.120[0.30] above the bottom of the pocket.
6. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
7. Pocket position relative to sprocket hole measured as true position of pocket. Not pocket hole.
8. Controlling dimension is millimeter. Dimension in inches rounded.

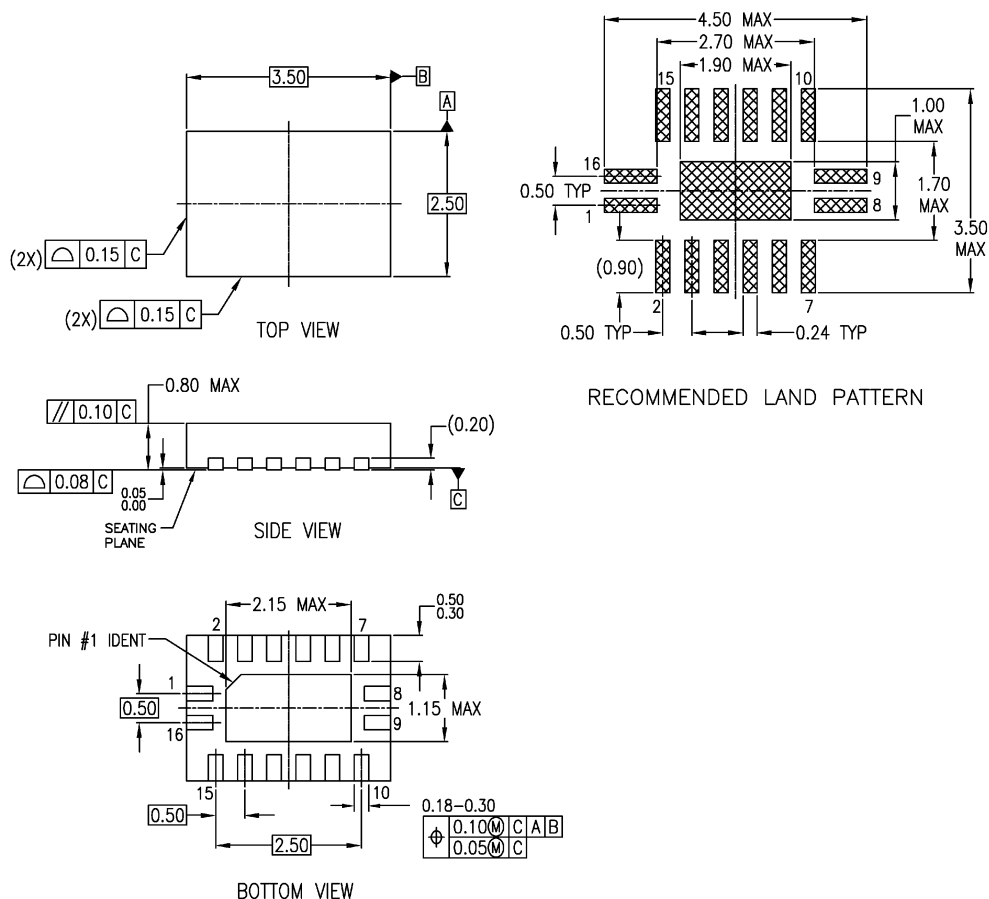
REEL DIMENSIONS inches (millimeters)



| Tape Size | A             | B               | C                | D                | N              | W1              | W2              |
|-----------|---------------|-----------------|------------------|------------------|----------------|-----------------|-----------------|
| 12 mm     | 13.0<br>(330) | 0.059<br>(1.50) | 0.512<br>(13.00) | 0.795<br>(20.20) | 7.008<br>(178) | 0.488<br>(12.4) | 0.724<br>(18.4) |



**Physical Dimensions** inches (millimeters) unless otherwise noted



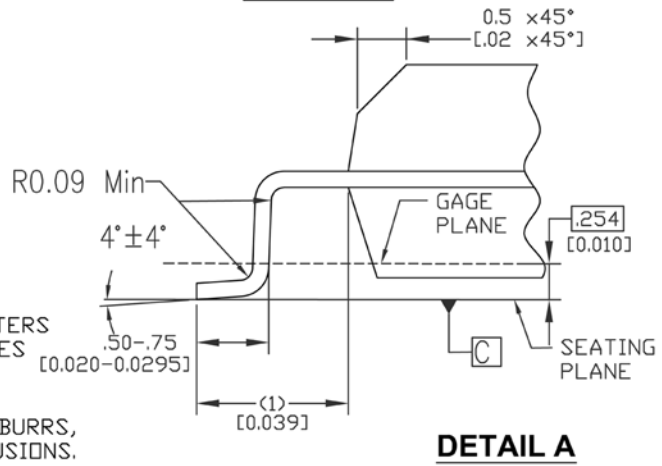
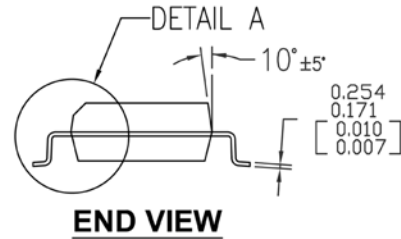
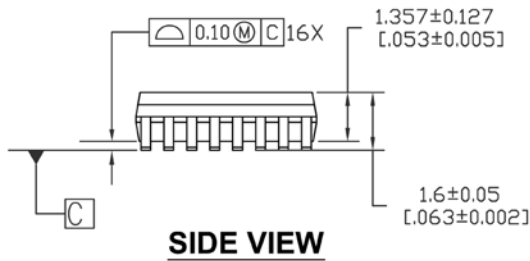
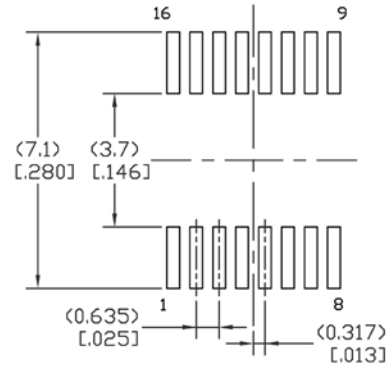
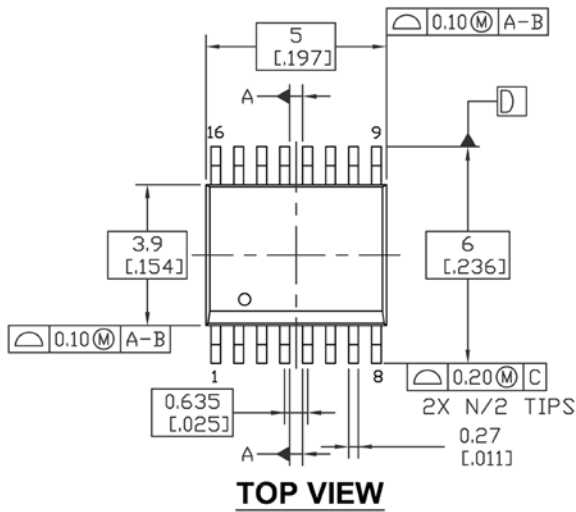
NOTES:

- A. CONFORMS TO JEDEC REGISTRATION MO-241, VARIATION AB
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994

MLP016ErevA

**Pb-Free 16-Terminal Depopulated Quad Very-Thin Flat Pack No Leads (DQFN), JEDEC MO-241, 2.5 x 3.5mm Package Number MLP016E**

**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



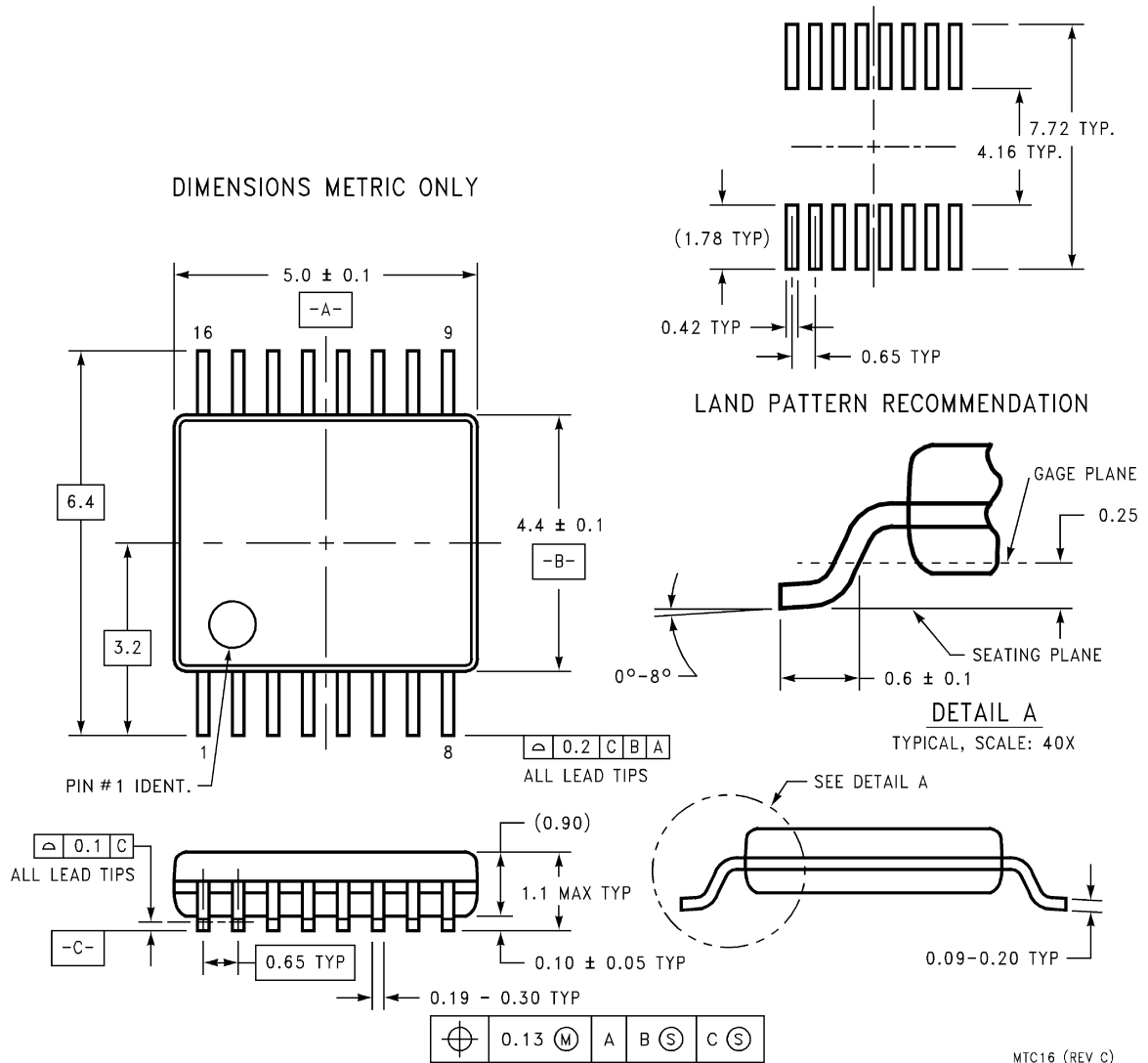
NOTES :

- A. THIS PACKAGE CONFORMS TO JEDEC MO-137 VARIATION AB
- B. PRIMARY DIMENSIONS IN MILLIMETERS  
REFERENCE DIMENSIONS IN INCHES
- C. DRAWING CONFORMS TO ASME Y14.5M-1994
- D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

MQA16AREVB

**16-Lead Quarter Size Outline Package (QSOP), JEDEC MO-137, 0.150 Wide  
Package Number MQA16A**

**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



**16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide  
Package Number MTC16**

**Technology Description**

The Fairchild Switch family derives from and embodies Fairchild's proven switch technology used for several years in its 74LVX3L384 (FST3384) bus switch product.

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provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is 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.

**PRODUCT STATUS DEFINITIONS**

Definition of terms

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