

## FSAV450 — 800MHz, 4-Channel, 2:1 Video Switch

### Features

- -50dB Off Isolation at 30MHz
- -80dB Non-Adjacent Channel Crosstalk at 30MHz
- 3dB Bandwidth: 800MHz
- On Resistance: 4Ω (Typical)
- Low Power Consumption: 1μA (Maximum)
- Control Input TTL Compatible

### Applications

- RGB Video Switch in LCD, Plasma and Projector Displays

### Description

The FSAV450 is a high performance Quad Single-Pole Double-Throw (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 (typical) 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 (4Ω typical) minimizes signal insertion loss. Low voltage operation (3V), low power consumption (1μA maximum) and small scale packaging (including leadless DQFN) make this device ideal for a broad range of applications.

### Ordering Information

| Part Number | Operating Temperature Range | Package   | Packing Method |
|-------------|-----------------------------|---|----------------|
| FSAV450BQX  | -40 to +85°C                | 16-Terminal Depopulated Quad Very-Thin Flat Pack No Leads (DQFN), JEDEC MO-241, 2.5 x 3.5mm | Tape and Reel  |

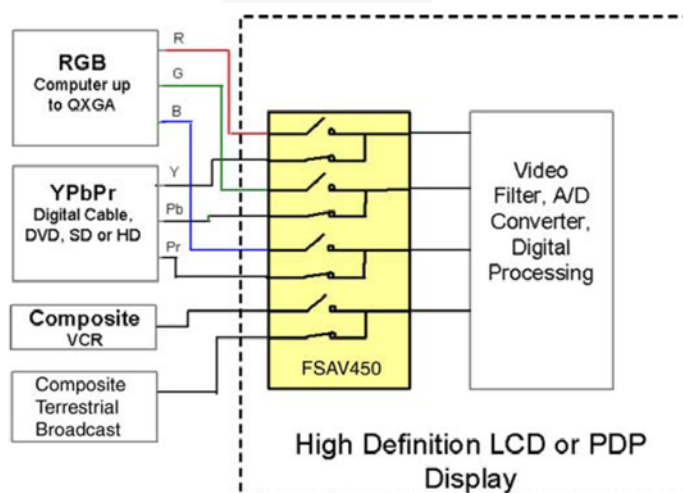


Figure 1. Typical Application Diagram

## Pin Configurations

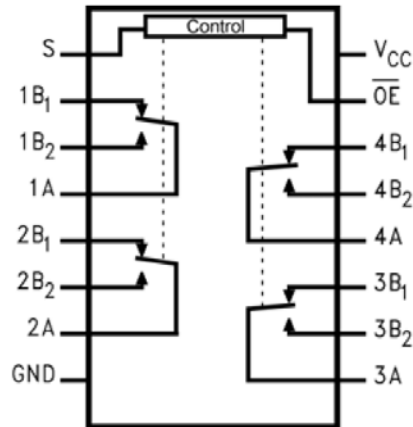


Figure 2. Analog Symbol

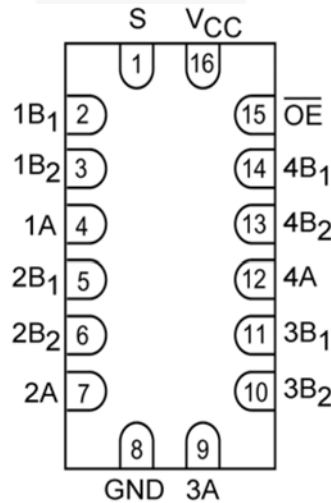


Figure 3. DQFN Pin Assignments

## Pin Descriptions

| Pin #                      | Name                           | Description        |
|----------------------------|--------------------------------|--------------------|
| 15                         | /OE                            | Bus Switch Enabled |
| 1                          | S                              | Select Input       |
| 4, 7, 9, 12                | A                              | Bus A              |
| 2, 3, 5, 6, 10, 11, 13, 14 | B <sub>1</sub> -B <sub>2</sub> | Bus B              |
| 8                          | GND                            | Ground             |
| 16                         | V <sub>CC</sub>                | Supply Voltage     |

## Truth Table

| S          | /OE  | Function         |
|------------|------|------------------|
| Don't Care | HIGH | Disconnected     |
| LOW        | LOW  | A=B <sub>1</sub> |
| HIGH       | LOW  | A=B <sub>2</sub> |

## 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        |
|------------------|---------------------------------------|------|-----------|-------------|
| $V_{CC}$         | Supply Voltage                        | -0.5 | +6.0      | V           |
| $V_S$            | DC Switch Voltage                     | -0.5 | +6.0      | V           |
| $V_{IN}$         | DC Input Voltage <sup>(1)</sup>       | -0.5 | +6.0      | V           |
| $I_{IK}$         | DC Input Diode Current, $V_{IN} < 0V$ | -50  |           | mA          |
| $I_{OUT}$        | DC Output Sink Current                |      | 128       | mA          |
| $I_{CC}/I_{GND}$ | DC $V_{CC}$ / GND Current             |      | $\pm 100$ | mA          |
| $T_{STG}$        | Storage Temperature Range             | -65  | +150      | $^{\circ}C$ |
| ESD              | Human Body Model, JESD22-A114         |      | 2000      | V           |

### Note:

- The input and output negative voltage 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.     | Unit        |
|------------|---------------------------------|----------------------|------|----------|-------------|
| $V_{CC}$   | Power Supply                    |                      | 4.0  | 5.5      | V           |
| $V_{IN}$   | Input Voltage                   |                      | 0    | $V_{CC}$ | V           |
| $V_{OUT}$  | Output Voltage                  |                      | 0    | $V_{CC}$ | V           |
| $t_r, t_f$ | Input Rise and Fall Time        | Switch Control Input | 0    | 5        | ns/V        |
|            |                                 | Switch I/O           | 0    | DC       |             |
| $T_A$      | Operating Temperature, Free Air |                      | -40  | +85      | $^{\circ}C$ |

### Note:

- Unused control inputs must be held HIGH or LOW; they may not float.

## DC Electrical Characteristics

Typical values are at  $T_A = +25^\circ\text{C}$ .

| Symbol          | Parameter                           | Conditions   | $V_{CC}$ (V) | $T_A = -40$ to $+85^\circ\text{C}$ |      |           | Units         |
|-----------------|-------------------------------------|--|--------------|------------------------------------|------|-----------|---------------|
|                 |                                     |  |              | Min.                               | Typ. | Max.      |               |
| $V_{ANALOG}$    | Analog Signal Range                 |  |              | 0                                  |      | 2         | V             |
| $V_{IK}$        | Clamp Diode Voltage                 | $I_{IN} = -18\text{mA}$                                      | 4.5          |                                    |      | -1.2      | V             |
| $V_{IH}$        | 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               | $0 \leq V_{IN} \leq 5.5\text{V}$                             | 5.5          |                                    |      | $\pm 1.0$ | $\mu\text{A}$ |
| $I_{OFF}$       | Off-State Leakage Current           | $0 \leq A, B \leq V_{CC}$                                    | 5.5          |                                    |      | $\pm 1.0$ | $\mu\text{A}$ |
| $R_{ON}$        | Switch On Resistance <sup>(3)</sup> | $V_{IN} = 1.0\text{V}, R_I = 75\Omega, I_{ON} = 13\text{mA}$ | 4.5          |                                    | 4    | 6         | $\Omega$      |
|                 |                                     | $V_{IN} = 2.0\text{V}, R_I = 75\Omega, I_{ON} = 26\text{mA}$ | 4.5          |                                    | 5    | 7         |               |
| $I_{CC}$        | Quiescent Supply Current            | $V_{IN} = V_{CC}$ or GND, $I_{OUT} = 0$                      | 5.5          |                                    |      | 1         | $\mu\text{A}$ |
| $\Delta I_{CC}$ | Increase in $I_{CC}$ per Input      | One Input at 3.4V<br>Other Inputs at $V_{CC}$ or GND         | 5.5          |                                    |      | 1.5       | mA            |

### Note:

3. Measured by the voltage drop between the A and B pins at the indicated current through the switch. On resistance is determined by the lower of the voltages on the A or B pins.

## AC Electrical Characteristics

Typical values are at  $V_{CC} = 5.0\text{V}$  and  $T_A = +25^\circ\text{C}$ .

| Symbol     | Parameter                           | Conditions                           | $V_{CC}$   | $T_A = -40$ to $+85^\circ\text{C}$ |      |      | Units    | Figure                  |
|------------|-------------------------------------|--------------------------------------|------------|------------------------------------|------|------|----------|-------------------------|
|            |                                     |                                      |            | Min.                               | Typ. | Max. |          |                         |
| $t_{ON}$   | Turn On Time<br>S to Bus B          | $V_B = 2\text{V}$                    | 4.5 to 5.5 |                                    | 4.0  | 6.0  | ns       | Figure 11,<br>Figure 12 |
|            | Output Enable<br>Time OE to A or B  |                                      |            |                                    | 3.5  | 5.5  |          |                         |
| $t_{OFF}$  | Turn Off Time<br>S to Bus B         | $V_B = 2\text{V}$                    | 4.5 to 5.5 |                                    | 1.5  | 3.5  | ns       | Figure 11,<br>Figure 12 |
|            | Output Disable<br>Time OE to A or B |                                      |            |                                    | 1.5  | 3.5  |          |                         |
| $D_G$      | Differential Gain                   | $R_L = 75\Omega, f = 3.58\text{MHz}$ | 4.5 to 5.5 |                                    | 0.2  |      | %        | Figure 5                |
| $D_P$      | Differential Phase                  | $R_L = 75\Omega, f = 3.58\text{MHz}$ | 4.5 to 5.5 |                                    | 0.1  |      | $^\circ$ | Figure 6                |
| $O_{IRR}$  | Non-Adjacent<br>Off Isolation       | $R_L = 75\Omega, f = 30\text{MHz}$   | 4.5 to 5.5 |                                    | -50  |      | dB       | Figure 7,<br>Figure 13  |
| $X_{TALK}$ | Non-Adjacent<br>Channel Crosstalk   | $R_L = 75\Omega, f = 30\text{MHz}$   | 4.5 to 5.5 |                                    | -80  |      | dB       | Figure 8,<br>Figure 14  |
| $B_W$      | -3dB Bandwidth                      | $R_L = 50\Omega$                     | 4.5 to 5.5 |                                    | 800  |      | MHz      | Figure 4,<br>Figure 15  |
|            |                                     | $R_L = 75\Omega$                     |            |                                    | 650  |      |          |                         |

## Capacitance

Typical values are at  $T_A = +25^\circ\text{C}$ .

| Symbol    | Parameter                     | Conditions                              | Typ. | Units |
|-----------|-------------------------------|---|------|-------|
| $C_{IN}$  | Control Pin Input Capacitance | $V_{CC} = 0\text{V}$                    | 3.0  | pF    |
| $C_{ON}$  | A/B On Capacitance            | $V_{CC} = 5.0\text{V}, /OE = 0\text{V}$ | 8.5  | pF    |
| $C_{OFF}$ | Port B Off Capacitance        | $V_{CC} = /OE = 5\text{V}$              | 3.0  | pF    |

## AC Characteristics

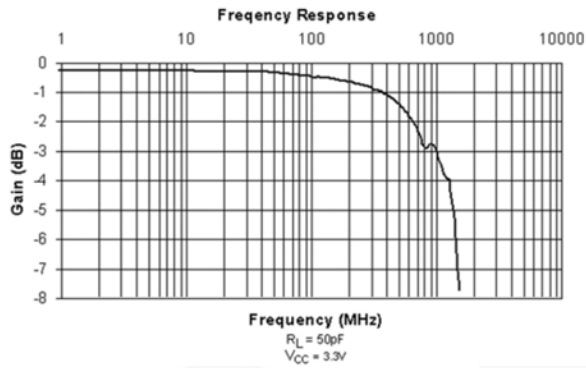


Figure 4. Gain vs. Frequency

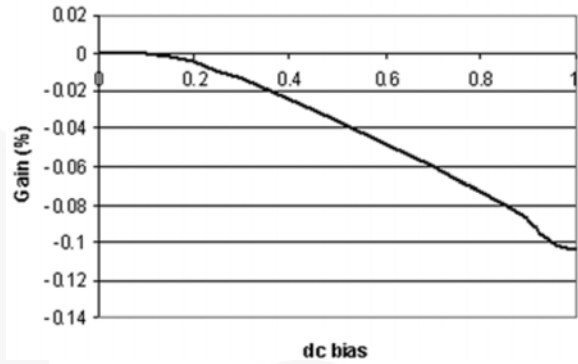


Figure 5. Differential Gain vs. DC bias

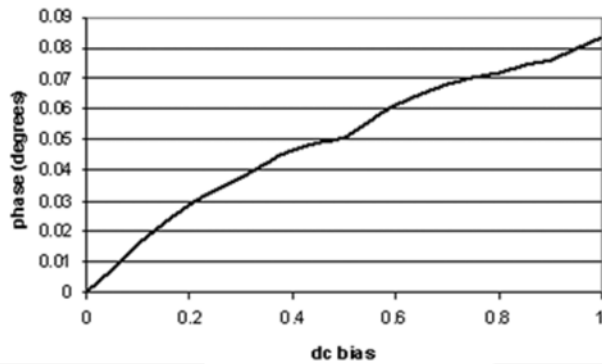


Figure 6. Differential Gain vs. DC bias

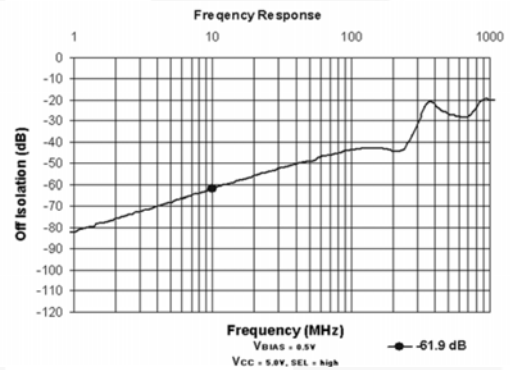


Figure 7. Off Isolation

## AC Characteristics

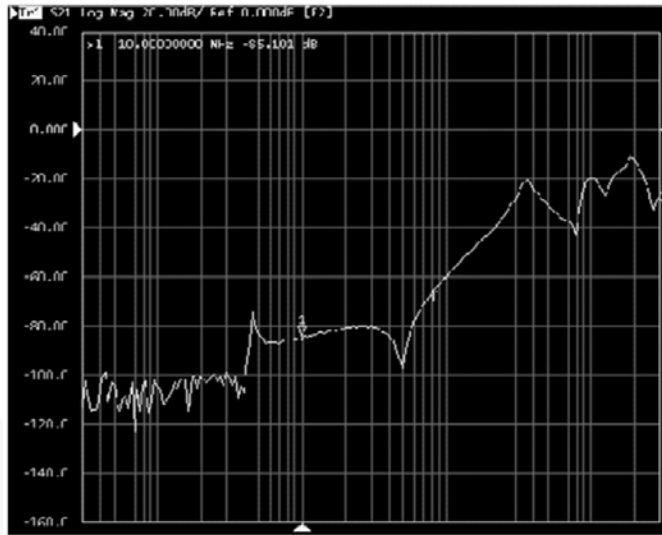


Figure 8. Off Crosstalk vs. Frequency

## R<sub>ON</sub> Switch Characteristics

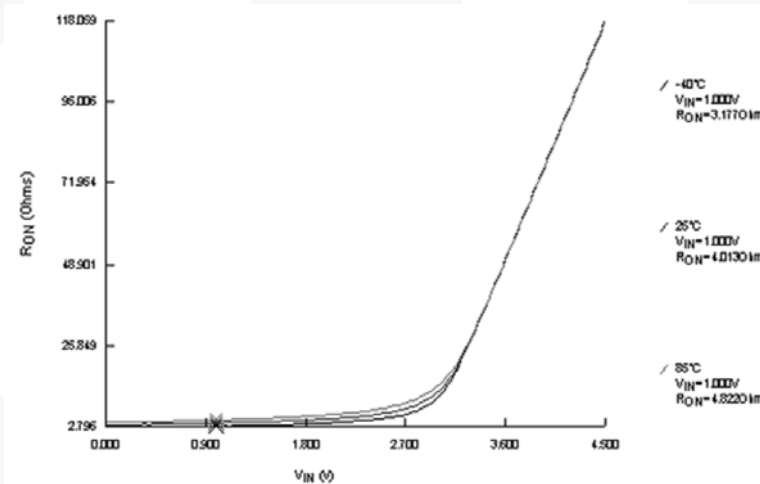


Figure 9. R<sub>ON</sub> Switch On Resistance, I<sub>ON</sub>=13mA

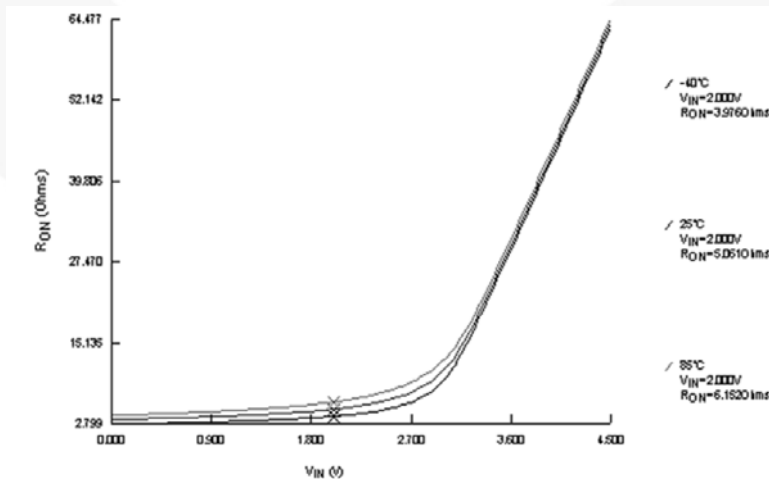
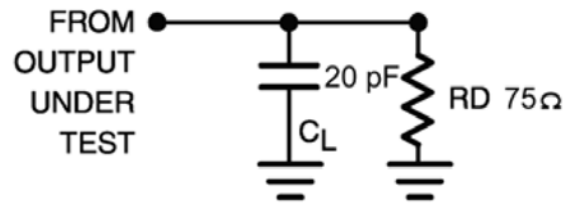


Figure 10. R<sub>ON</sub> Switch On Resistance, I<sub>ON</sub>=26mA

## AC Loadings and Waveforms



### Notes:

4. Input drive by 50Ω source terminated in 50Ω.
5.  $C_L$  includes load and stray capacitance.
6. Input PRR=1.0MHz,  $t_W=500ns$ .

Figure 11. AC Test Circuit

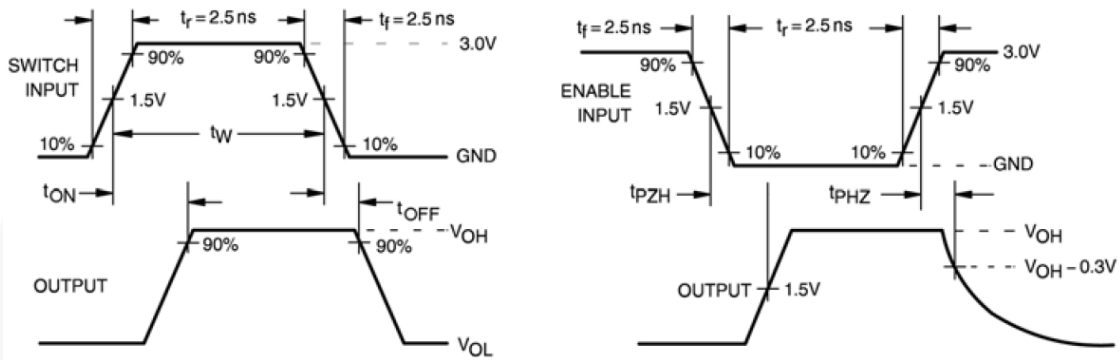


Figure 12. AC Waveforms

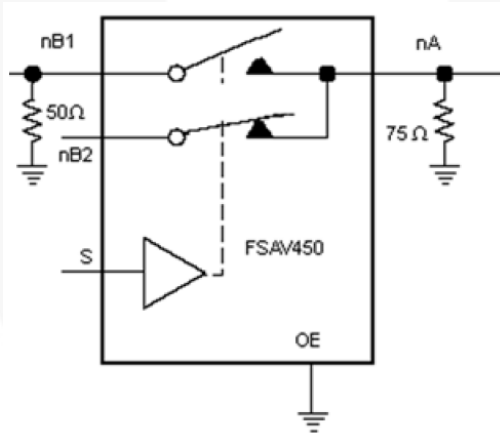


Figure 13. Off Isolation Test

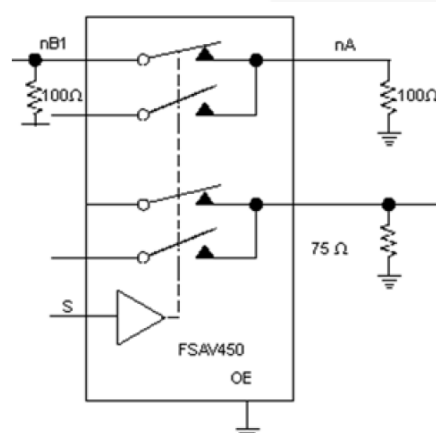


Figure 14. Crosstalk

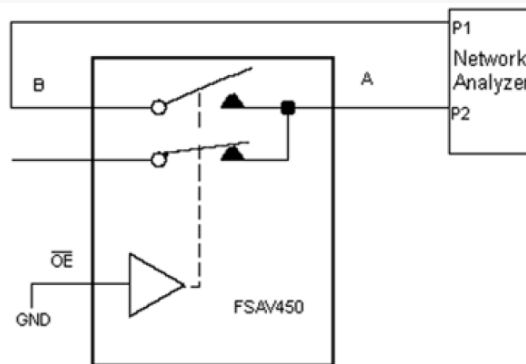
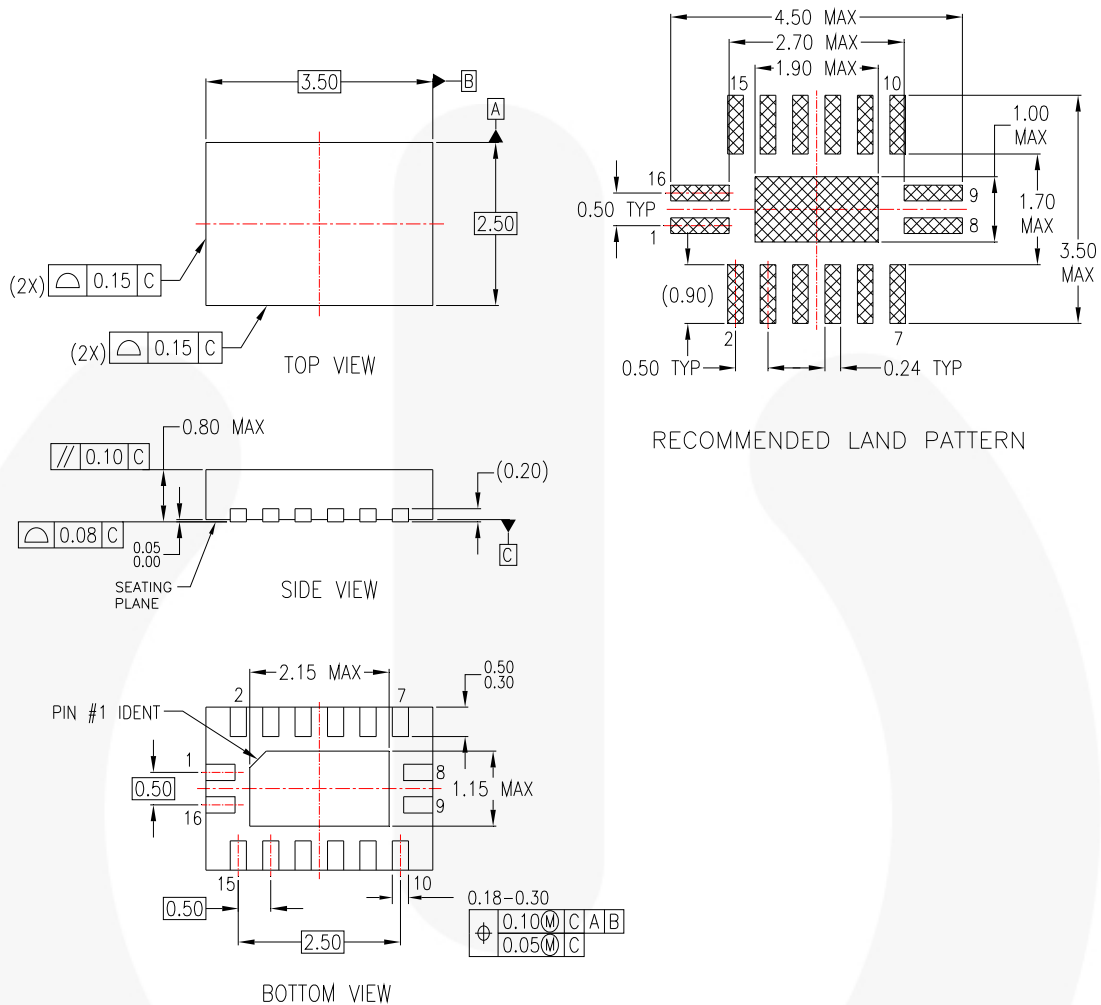


Figure 15. Bandwidth

## Physical Dimensions



### NOTES:

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

MLP16ErevA

**Figure 16. 16-Terminal Depopulated Quad Very-Thin Flat Pack No Leads (DQFN), JEDEC MO-241**

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.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:  
<http://www.fairchildsemi.com/packaging/>

For current tape and reel specifications, visit Fairchild Semiconductor's online packaging area:  
<http://www.fairchildsemi.com/ms/MS/MS-522.pdf>





**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™                 | Power-SPM™                          | The Power Franchise®                   |
| Auto-SPM™                | FRFET®                 | PowerTrench®                        | The Right Technology for Your Success™ |
| AX-CAP™*                 | Global Power Resource™ | PowerXS™                            | <b>the power franchise</b>             |
| Build it Now™            | Green FPST™            | Programmable Active Droop™          | TinyBoost™                             |
| CorePLUS™                | Green FPS™ e-Series™   | QFET®                               | TinyBuck™                              |
| CorePOWER™               | Gmax™                  | QS™                                 | TinyCalc™                              |
| CROSSVOLT™               | GTO™                   | Quiet Series™                       | TinyLogic®                             |
| CTL™                     | IntelliMAX™            | RapidConfigure™                     | TINYOPTO™                              |
| Current Transfer Logic™  | ISOPLANAR™             | ™                                   | TinyPower™                             |
| DEUXPEED®                | MegaBuck™              | Saving our world, 1mW/kW at a time™ | TinyPWM™                               |
| Dual Cool™               | MI CROCOUPLER™         | SignalWise™                         | TinyWire™                              |
| EcoSPARK®                | MicroFET™              | SmartMax™                           | TnFault Detect™                        |
| EfficientMax™            | MicroPak™              | SMART START™                        | TRUECURRENT®*                          |
| ESBC™                    | MicroPak2™             | SPM®                                | µSerDes™                               |
| <b>F</b> ®               | MillerDrive™           | STEALTH™                            | SerDes™                                |
| Fairchild®               | MotionMax™             | SuperFET®                           | UHC®                                   |
| Fairchild Semiconductor® | Motion-SPM™            | SuperSOT™-3                         | Ultra FRFET™                           |
| FACT Quiet Series™       | mWSaver™               | SuperSOT™-6                         | UniFET™                                |
| FACT®                    | OptoHit™               | SuperSOT™-8                         | VCX™                                   |
| FAST®                    | OPTOLOGIC®             | SupreMOS®                           | VisualMax™                             |
| FastvCore™               | OPTOPLANAR®            | SynCFET™                            | XST™                                   |
| FETBench™                | ™                      | SynC-Lock™                          |  |
| FlashWriter®*            | PDP SPM™               | SYSTEM GENERAL®*                    |  |
| FPST™                    |                        |                                     |  |

\* 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. 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.

**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 FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

- 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 of the user.
- 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.

**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 Sales Support.

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. 153