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Contact us

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FSAV331 — Dual-Channel, 4:1 Video Switch

Features

- Wide Bandwidth: 300MHz
- -73dB Non-Adjacent Channel Crosstalk at 10MHz
- -56dB Off Isolation at 10MHz
- On Resistance: 3Ω (Typical)
- Low Power Consumption: 3μA (Maximum)
- Control Inputs Compatible with TTL Level

Applications

- Y/C Video or CVBS Video Switch in LCD, Plasma, and Projector Displays

Description

The Fairchild video switch FSAV331 is a dual 4:1 high speed video switch which can be configured as either multiplexer or demultiplexer. Low on-resistance allows inputs to be connected to outputs without adding propagation delay or generating additional ground bounce noise.

When the OE Pin is LOW, S₀ and S₁ connect the A Port to the selected B Port output. When the OE Pin is HIGH, the switch is OPEN and a HIGH-Impedance state exists between the two ports.

Ordering Information

| Part Number | Operating Temperature Range | Package | Packing Method |
|-------------|-----------------------------|--|----------------|
| FSAV331MTCX | -40 to +85°C | 16-Lead, Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide | Tape and Reel |

Pin Configurations

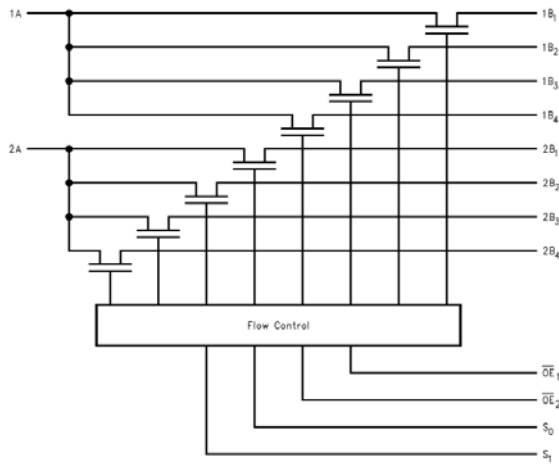


Figure 1. Logic Diagram

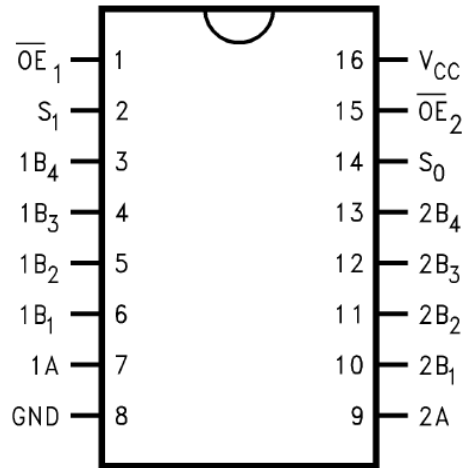


Figure 2. Pin Assignments

Pin Descriptions

| Pin # | Name | Description |
|----------------|---|---------------------|
| 1, 15 | /OE ₁ , /OE ₂ | Port Enable |
| 2, 14 | S ₁ , S ₀ | Select Input |
| 3, 4, 5, 6 | 1B ₄ , 1B ₃ , 1B ₂ , 1B ₁ | B-Ports (Channel 1) |
| 7, 9 | 1A, 2A | A-Ports |
| 8 | GND | Ground |
| 10, 11, 12, 13 | 2B ₁ , 2B ₂ , 2B ₃ , 2B ₄ | B-Ports (Channel 2) |
| 16 | V _{CC} | Supply Voltage |

Truth Table

| S ₁ | S ₀ | /OE ₁ | /OE ₂ | Function |
|----------------|----------------|------------------|------------------|------------------|
| Don't Care | Don't Care | HIGH | Don't Care | Disconnect 1A |
| Don't Care | Don't Care | Don't Care | HIGH | Disconnect 2A |
| LOW | LOW | LOW | LOW | A=B ₁ |
| LOW | HIGH | LOW | LOW | A=B ₂ |
| HIGH | LOW | LOW | LOW | A=B ₃ |
| HIGH | HIGH | LOW | LOW | A=B ₄ |

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 | +7.0 | V |
| V _S | DC Switch Voltage | -0.5 | V _{CC} +0.5 | V |
| V _{IN} | DC Input Voltage ⁽¹⁾ | -0.5 | +7.0 | V |
| I _{IK} | DC Input Diode Current | -50 | | mA |
| I _{OUT} | DC Output Current | | 128 | mA |
| T _{STG} | Storage Temperature Range | -65 | +150 | °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 | 4.75 | 5.25 | V |
| V _{IN} | Control Input Voltage | 0 | V _{CC} | V |
| V _{SW} | Switch Input Voltage | 0 | V _{CC} | V |
| T _A | Operating Temperature, Free Air | -40 | +85 | °C |
| θ _{JA} | Thermal Resistance | | 100 | °C/W |

Note:

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

DC Electrical Characteristics

Typical values are at V_{CC}=5.0V and T_A= +25°C.

| Symbol | Parameter | Conditions | V _{CC} (V) | T _A = -40 to +85°C | | | Units |
|---------------------|-------------------------------------|--|---------------------|-------------------------------|------|------|-------|
| | | | | Min. | Typ. | Max. | |
| V _{ANALOG} | Analog Signal Range | | 4.75 to 5.25 | 0 | | 2 | V |
| V _{IK} | Clamp Diode Voltage | I _{IN} =-18mA | 4.75 | | | -1.2 | V |
| V _{IH} | High-Level Input Voltage | | 4.75 to 5.25 | 2.0 | | | V |
| V _{IL} | Low-Level Input Voltage | | 4.75 to 5.25 | | | 0.8 | V |
| I _{IN} | Control Input Leakage | V _{IN} =0V to V _{CC} | 5.25 | | | ±1.0 | μA |
| I _{OZ} | Off-State Leakage Current | 0 ≤ A, B ≤ V _{CC} | 5.25 | | | ±1.0 | μA |
| R _{ON} | Switch On Resistance ⁽³⁾ | V _{IN} =1.0V, I _{ON} =13mA | 4.75 | | 3 | 7 | Ω |
| | | V _{IN} =2.0V, I _{ON} =26mA | 4.75 | | 5 | 10 | |
| I _{CC} | Quiescent Supply Current | V _{IN} =0V or V _{CC} , I _{OUT} =0 | 5.25 | | | 3 | μA |

Note:

- 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 $T_A=+25^\circ\text{C}$ and $V_{CC}=5.0\text{V}$

| Symbol | Parameter | Conditions | V_{CC} (V) | $T_A = -40 \text{ to } +85^\circ\text{C}$ | | | Units | Figure |
|--------------------|--|--|--------------|---|-------|------|-------|-----------------------|
| | | | | Min. | Typ. | Max. | | |
| t_{ON} | Turn On Time; S to B | $V_I=7\text{V}$ for t_{PZL} $V_I=\text{Open}$ for t_{PZH} | 4.75 to 5.25 | 1.0 | | 5.3 | ns | Figure 3, Figure 4 |
| | Output Enable Time OE to A or B | | | 1.0 | | 5.3 | | |
| t_{OFF} | Turn Off Time; S to B | $V_I=7\text{V}$ for t_{PLZ} $V_I=\text{Open}$ for t_{PHZ} | 4.75 to 5.25 | 1.0 | | 5.8 | ns | Figure 3, Figure 4 |
| | Output Disable Time OE to A or B | | | 1.0 | | 5.5 | | |
| t_{PLH}, t_{PHL} | Propagation Delay ⁽⁴⁾ | $V_I=\text{Open}$ | 4.75 to 5.25 | | | 0.1 | ns | |
| | Select to A Delay | | | | | 5.0 | | |
| D_G | Differential Gain ⁽⁵⁾ | $R_L=150\Omega$, $f=3.58\text{MHz}$ | 4.75 to 5.25 | | 0.26 | | % | |
| D_P | Differential Phase ⁽⁵⁾ | $R_L=150\Omega$, $f=3.58\text{MHz}$ | 4.75 to 5.25 | | 0.23 | | ° | |
| O_{IRR} | Non Adjacent Off Isolation | $R_L=150\Omega$, $f=10\text{MHz}$ | 4.75 to 5.25 | | -56.0 | | dB | Figure 5 |
| X_{TALK} | Non Adjacent Channel Crosstalk ⁽⁵⁾ | $R_L=150\Omega$, $f=10\text{MHz}$ | 4.75 to 5.25 | | -73.0 | | dB | Figure 6 |
| B_W | -3dB Bandwidth ⁽⁵⁾ | $R_L=50\Omega$ | 4.75 to 5.25 | | 300 | | MHz | Figure 7 |

Note:

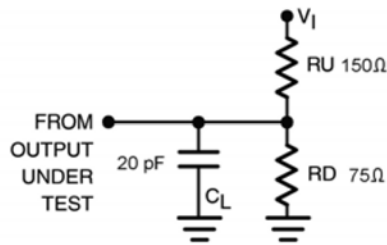
- This parameter is guaranteed by design.
- This parameter is guaranteed by device characterization, not production tested.

Capacitance

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

| Symbol | Parameter | Conditions | Typ. | Units |
|-----------|-------------------------------|-------------------------------------|------|-------|
| C_{IN} | Control Pin Input Capacitance | $V_{CC}=5.0\text{V}$ | 2 | pF |
| C_{ON} | A/B On Capacitance | $V_{CC}=5.0\text{V}, /OE=0\text{V}$ | 39 | pF |
| C_{OFF} | A Port | $V_{CC}, /OE=5.0\text{V}$ | 13 | pF |
| | B Port | | 5 | |

AC Loadings and Waveforms



Notes:

6. Input drive by 50Ω source terminated in 50Ω .
7. C_L includes load and stray capacitance.
8. Input PRR=1.0MHz, $t_w=500\text{ns}$.

Figure 3. AC Test Circuit

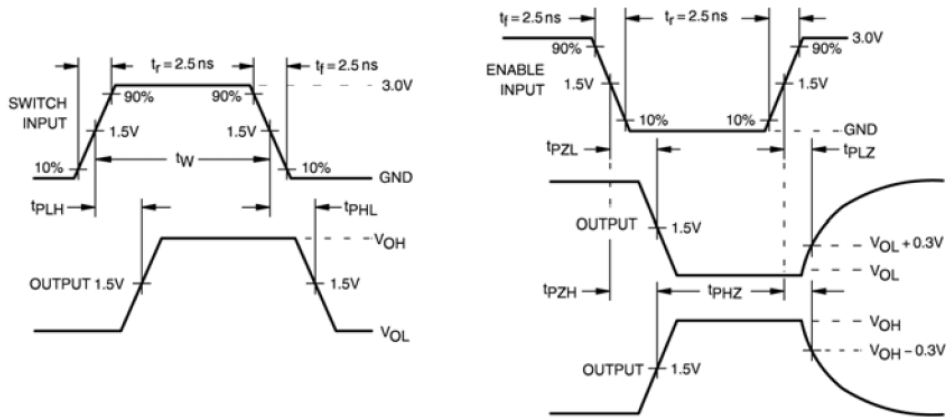


Figure 4. AC Waveforms

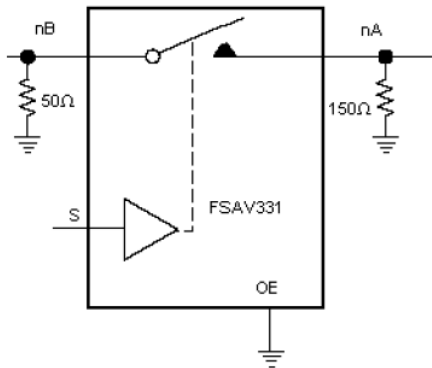


Figure 5. Off Isolation

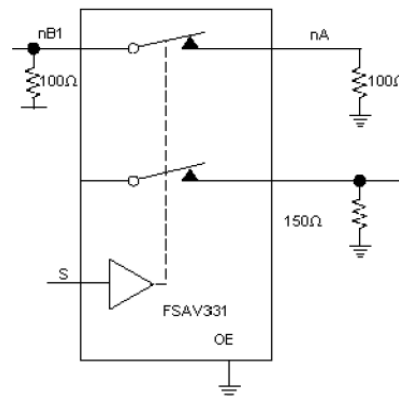


Figure 6. Crosstalk

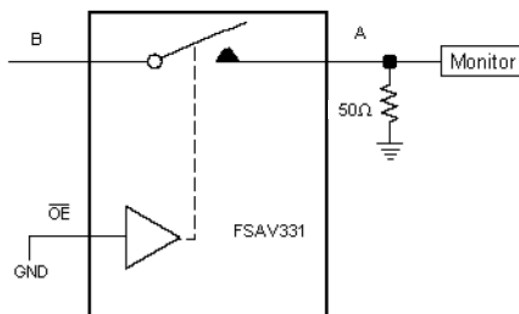


Figure 7. Bandwidth



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