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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, S<sub>0</sub> and S<sub>1</sub> 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

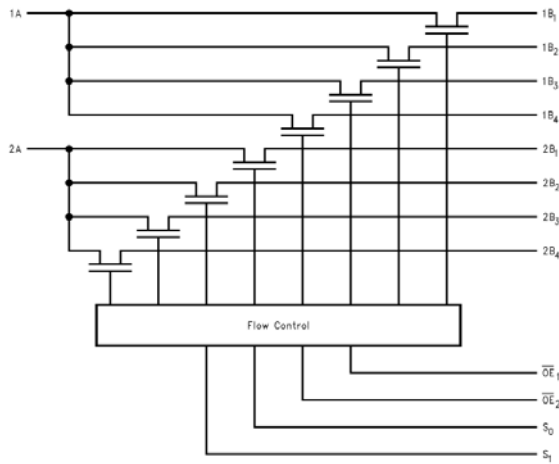


Figure 1. Logic Diagram

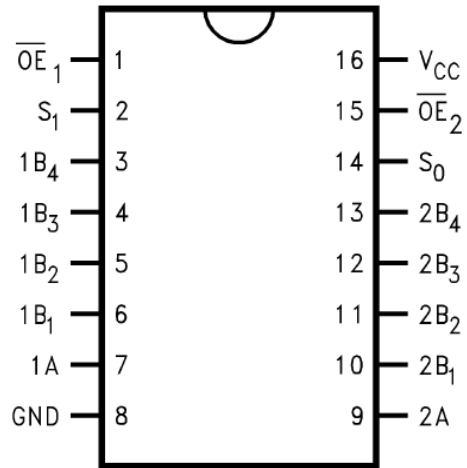


Figure 2. Pin Assignments

## Pin Descriptions

Pin #	Name	Description
1, 15	$\overline{OE}_1, \overline{OE}_2$	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

$S_1$	$S_0$	$\overline{OE}_1$	$\overline{OE}_2$	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 <sub>CC</sub>	Supply Voltage	-0.5	+7.0	V
V <sub>S</sub>	DC Switch Voltage	-0.5	V <sub>CC</sub> +0.5	V
V <sub>IN</sub>	DC Input Voltage <sup>(1)</sup>	-0.5	+7.0	V
I <sub>IK</sub>	DC Input Diode Current	-50		mA
I <sub>OUT</sub>	DC Output Current		128	mA
T <sub>STG</sub>	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 <sub>CC</sub>	Power Supply	4.75	5.25	V
V <sub>IN</sub>	Control Input Voltage	0	V <sub>CC</sub>	V
V <sub>SW</sub>	Switch Input Voltage	0	V <sub>CC</sub>	V
T <sub>A</sub>	Operating Temperature, Free Air	-40	+85	°C
θ <sub>JA</sub>	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<sub>CC</sub>=5.0V and T<sub>A</sub>= +25°C.

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	T <sub>A</sub> = -40 to +85°C			Units
				Min.	Typ.	Max.	
V <sub>ANALOG</sub>	Analog Signal Range		4.75 to 5.25	0		2	V
V <sub>IK</sub>	Clamp Diode Voltage	I <sub>IN</sub> =-18mA	4.75			-1.2	V
V <sub>IH</sub>	High-Level Input Voltage		4.75 to 5.25	2.0			V
V <sub>IL</sub>	Low-Level Input Voltage		4.75 to 5.25			0.8	V
I <sub>IN</sub>	Control Input Leakage	V <sub>IN</sub> =0V to V <sub>CC</sub>	5.25			±1.0	μA
I <sub>OZ</sub>	Off-State Leakage Current	0 ≤ A, B ≤ V <sub>CC</sub>	5.25			±1.0	μA
R <sub>ON</sub>	Switch On Resistance <sup>(3)</sup>	V <sub>IN</sub> =1.0V, I <sub>ON</sub> =13mA	4.75		3	7	Ω
		V <sub>IN</sub> =2.0V, I <sub>ON</sub> =26mA	4.75		5	10	
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> =0V or V <sub>CC</sub> , I <sub>OUT</sub> =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)	$T_A = -40$ 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 <sup>(4)</sup>	$V_I=\text{Open}$	4.75 to 5.25			0.1	ns	
	Select to A Delay					5.0		
$D_G$	Differential Gain <sup>(5)</sup>	$R_L=150\Omega$ , $f=3.58\text{MHz}$	4.75 to 5.25		0.26		%	
$D_P$	Differential Phase <sup>(5)</sup>	$R_L=150\Omega$ , $f=3.58\text{MHz}$	4.75 to 5.25		0.23		$^{\circ}$	
$O_{IRR}$	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 <sup>(5)</sup>	$R_L=150\Omega$ , $f=10\text{MHz}$	4.75 to 5.25		-73.0		dB	Figure 6
$B_W$	-3dB Bandwidth <sup>(5)</sup>	$R_L=50\Omega$	4.75 to 5.25		300		MHz	Figure 7

### Note:

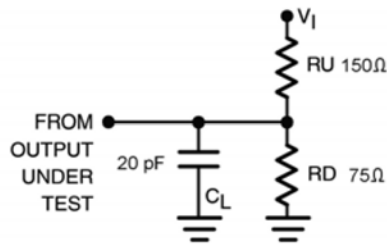
- This parameter is guaranteed by design.
- This parameter is guaranteed by device characterization, not production tested.

## 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	

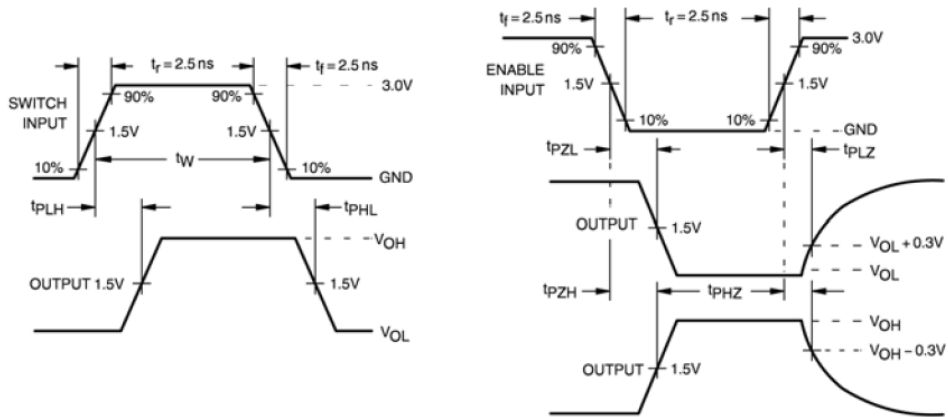
## AC Loadings and Waveforms



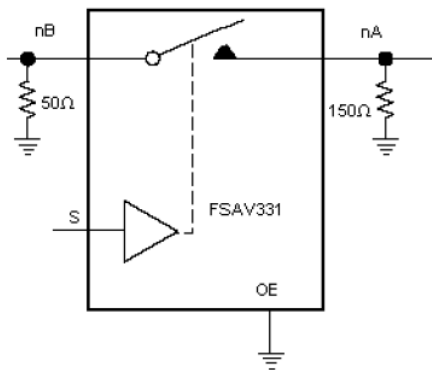
**Notes:**

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

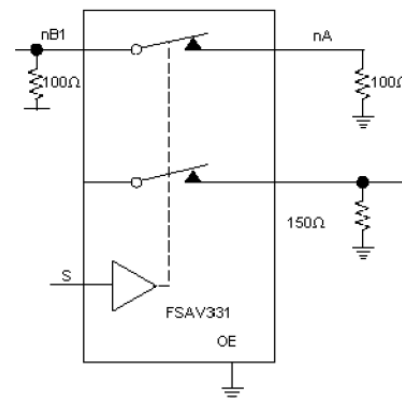
**Figure 3. AC Test Circuit**



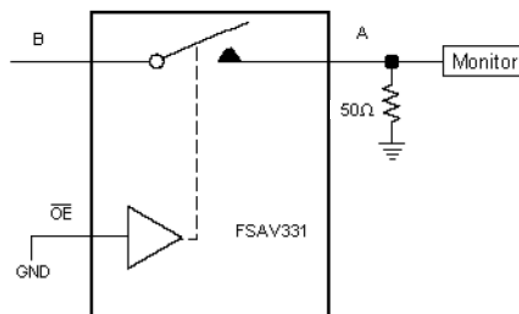
**Figure 4. AC Waveforms**



**Figure 5. Off Isolation**

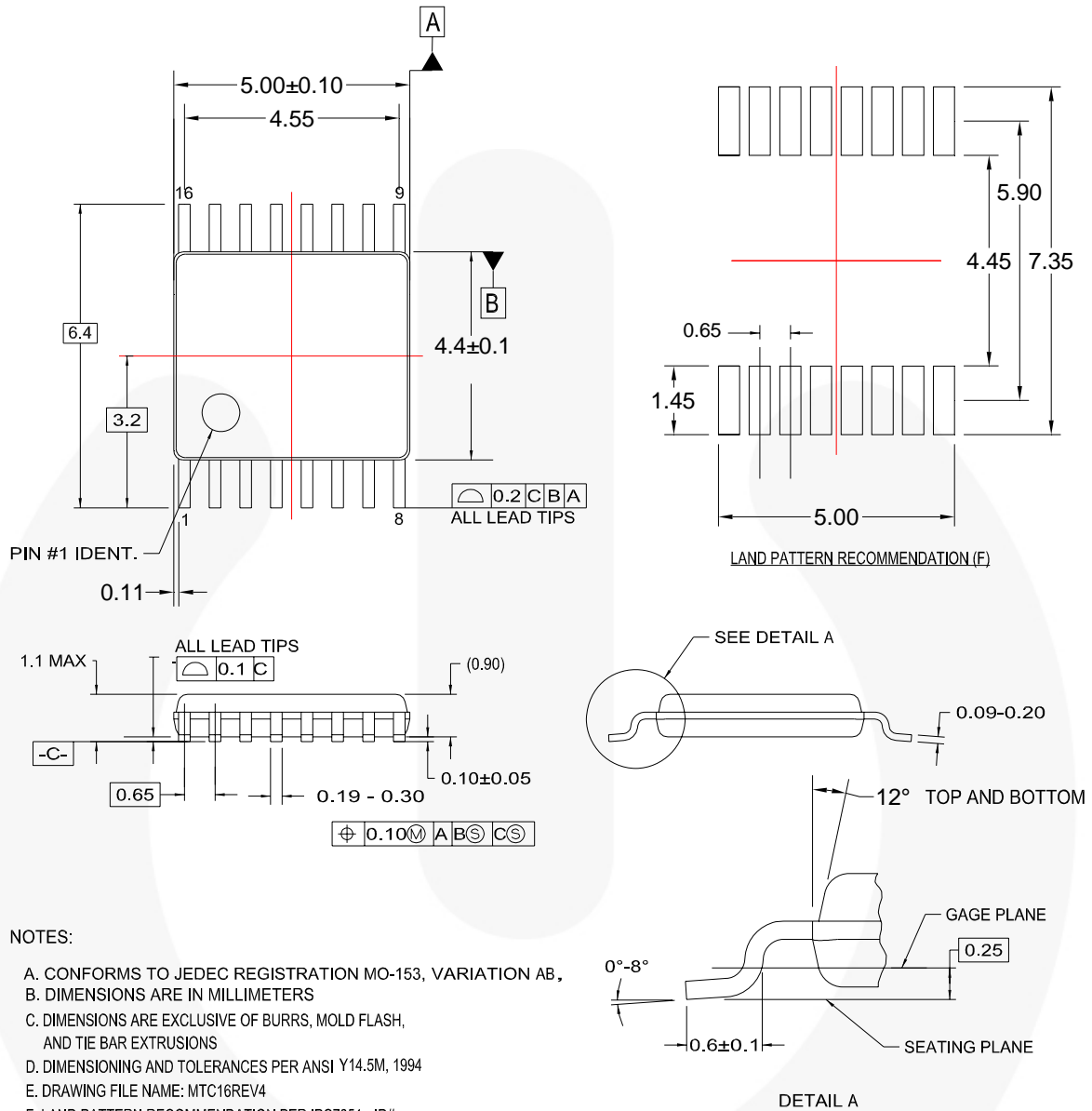


**Figure 6. Crosstalk**



**Figure 7. Bandwidth**

## Physical Dimensions



**Figure 8. 16-Lead, Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide**







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