

# FSAV433 — High-Bandwidth (550MHz), 3-Channel, 3:1 Video Switch

## Features

- Ground between Channels to Optimize Isolation and Reduce Hostile Crosstalk
- -70dB Non-Adjacent Channel Crosstalk at 30MHz
- On Resistance: 6.5Ω (Typical)
- -3dB Bandwidth: 550MHz
- Low Power Consumption: 1μA (Maximum)

## Applications

- RGB Video Switch in LCD, Plasma and Projector Displays
- DVD-RW

## Description

The FSAV433 is an ultra-low power, high-bandwidth video switch specially designed for switching three analog video signals, including computer RGB and high-definition YPbPr signals. The wide bandwidth (550MHz) of the switch allows signal passage with minimum edge and phase distortion, while -70dB non-adjacent channel crosstalk generates negligible image noise between active channels. Optimized differential gain and phases maintain the image integrity of video applications, while low on resistance offers low signal insertion loss.

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

## Ordering Information

Part Number	Operating Temperature Range	Package	Packing Method
FSAV433MTCX	-40 to +85°C	20-Lead, Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide	Tape and Reel

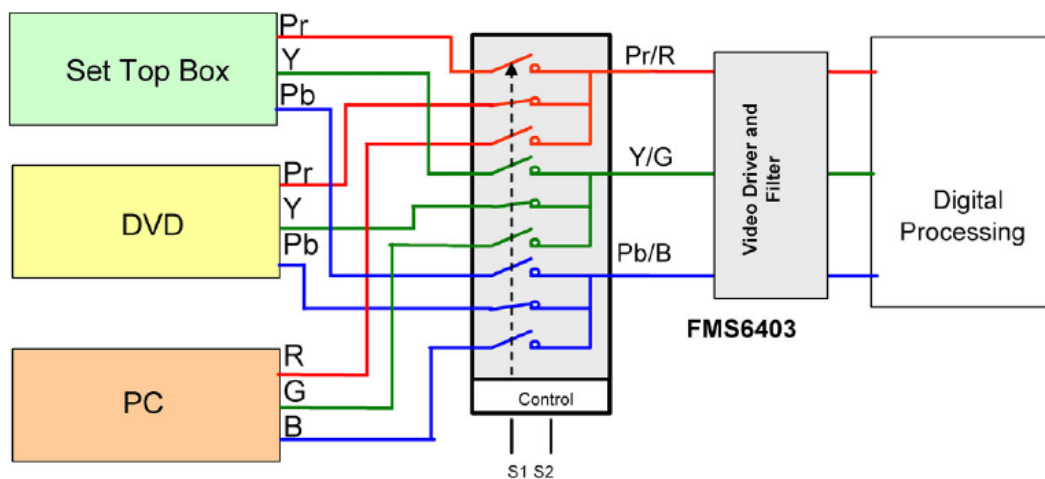


Figure 1. Typical Application Diagram

## Pin Configurations

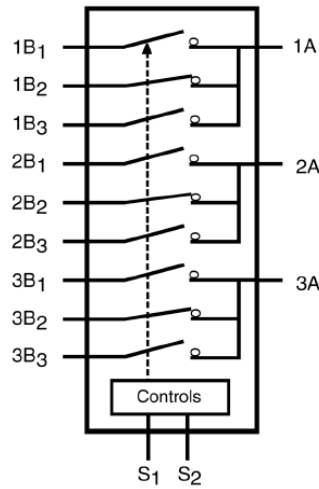


Figure 2. Analog Symbol

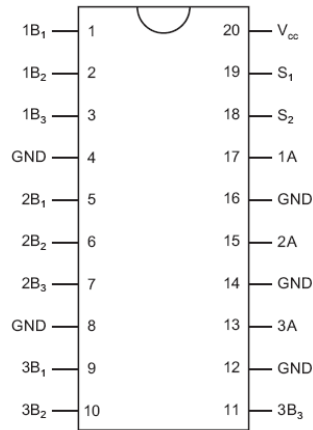


Figure 3. TSSOP Pin Assignments (Top Through View)

## Pin Descriptions

Pin #	Name	Description
1, 2, 3, 5, 6, 7, 9, 10, 11	1B <sub>1</sub> , 2B <sub>2</sub> , 3B <sub>2</sub>	Bus B
4, 8, 12, 14, 16	GND	Ground
13, 15, 17	1A, 2A, 3A	Bus A
18, 19	S <sub>1</sub> , S <sub>2</sub>	Select Input
20	V <sub>CC</sub>	Supply Voltage

## Truth Table

S <sub>1</sub>	S <sub>2</sub>	Function
LOW	LOW	Disconnected
LOW	HIGH	A=B <sub>1</sub>
HIGH	LOW	A=B <sub>2</sub>
HIGH	HIGH	A=B <sub>3</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 <sub>CC</sub>	Supply Voltage	-0.5	+4.6	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	+4.6	V
I <sub>IK</sub>	DC Input Diode Current, V <sub>IN</sub> < 0V	-50		mA
I <sub>OUT</sub>	DC Output Sink Current		100	mA
I <sub>CC</sub> /I <sub>GND</sub>	DC V <sub>CC</sub> / GND Current		±100	mA
T <sub>STG</sub>	Storage Temperature Range	-65	+150	°C
ESD	Human Body Model, JESD22-A114		7000	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 Operating	2.3	3.6	V
V <sub>IN</sub>	Input Voltage	0	V <sub>CC</sub>	V
T <sub>A</sub>	Operating Temperature, Free Air	-40	+85	°C

**Note:**

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

## DC Electrical Characteristics

Typical values are at 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		2.3 to 3.0	0		2	V	
V <sub>IK</sub>	Clamp Diode Voltage	I <sub>IN</sub> = -18mA	3.0			-1.2	V	
V <sub>IH</sub>	High-Level Input Voltage		2.3	1.8			V	
			3.0 to 3.6	2.0				
V <sub>IL</sub>	Low-Level Input Voltage		2.3			0.8	V	
			3.0 to 3.6					
I <sub>I</sub>	Input Leakage Current	0 ≤ V <sub>IN</sub> ≤ 3.6V	3.6			±1.0	μA	
I <sub>OFF</sub>	Off-State Leakage Current	0 ≤ A, B ≤ V <sub>CC</sub> , See Figure 9	3.6			±1.0	μA	
R <sub>ON</sub>	Switch On Resistance <sup>(3)</sup>	V <sub>IN</sub> = 1.0V, I <sub>ON</sub> = 13mA, See Figure 7	2.3		9.0	13.0	Ω	
			3.0		6.5	9.0		
		3.0		2.3		10.0		15.0
				3.0		6.5		9.0
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND, I <sub>OUT</sub> = 0	3.6			1	μA	
I <sub>CCCT</sub>	Increase in I <sub>CC</sub> per Input	One Control Input at 3.0V Other Inputs at V <sub>CC</sub> or GND	3.6			10	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  $V_{CC}=3.3V$  and  $T_A=+25^{\circ}C$ .

Symbol	Parameter	Conditions	$V_{CC}$	$T_A=-40\text{ to }+85^{\circ}C$			Units	Figure
				Min.	Typ.	Max.		
$t_{ON}$	Turn On Time S to Bus A	$V_B=2V$	3.0 to 3.6			5.5	ns	Figure 8, Figure 10
			2.3 to 2.7			7		
$t_{OFF}$	Turn Off Time S to Bus A	$V_B=2V$	3.0 to 3.6			4	ns	Figure 8, Figure 10
			2.3 to 2.7			5		
$D_G$	Differential Gain	$R_L=75\Omega$ , $f=3.58MHz$	3.0 to 3.6		0.2		%	
$D_P$	Differential Phase	$R_L=75\Omega$ , $f=3.58MHz$	3.0 to 3.6		0.1		$^{\circ}$	
$O_{IRR}$	Non-Adjacent Off Isolation	$R_L=75\Omega$ , $f=30MHz$	3.0 to 3.6		-45		dB	Figure 13
	Adjacent Off Isolation		2.3 to 2.7		-45			
$X_{TALK}$	Non-Adjacent Channel Crosstalk	$R_L=75\Omega$ , $f=30MHz$	3.0 to 3.6		-70		dB	Figure 15
	Adjacent Channel Crosstalk		2.3 to 2.7		-70			Figure 14
$B_W$	-3dB Bandwidth	$R_L=50\Omega$	3.0 to 3.6		550		MHz	Figure 12
		$R_L=75\Omega$			300			

## Capacitance

Typical values are at  $V_{CC}=3.3V$  and  $T_A=+25^{\circ}C$ .

Symbol	Parameter	Conditions	Typ.	Units	Figure
$C_{IN}$	Control Pin Input Capacitance	$V_{CC}=0V$	3	pF	
$C_{ON}$	A/B On Capacitance	$V_{CC}=3.0V=0V$	15	pF	Figure 17
$C_{OFF}$	Port B Off Capacitance	$V_{CC}=3.3V$	4	pF	Figure 16

Typical Characteristics

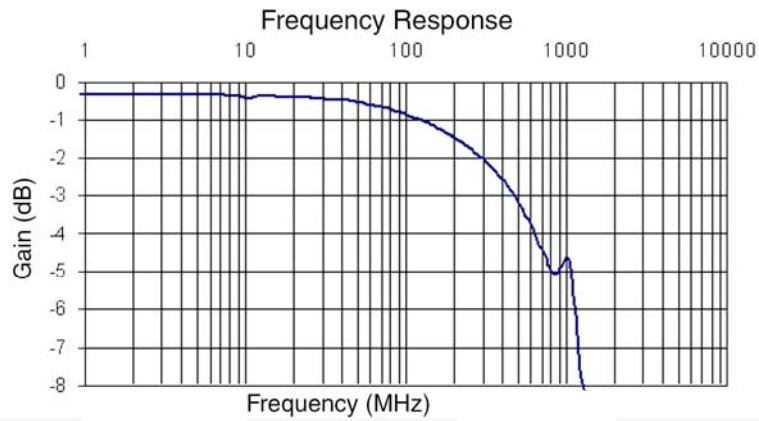


Figure 4. Gain vs. Frequency ( $V_{BAIS}=0.5V$ ,  $V_{CC}=3.6V$ ,  $R_L=50\Omega$ )

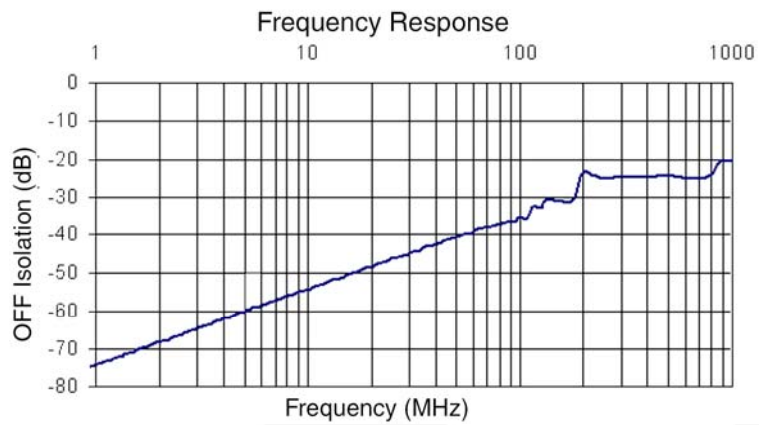


Figure 5. Off Isolation ( $V_{BAIS}=0.5V$ ,  $V_{CC}=3.0V$ ,  $SEL_n=LOW$ )

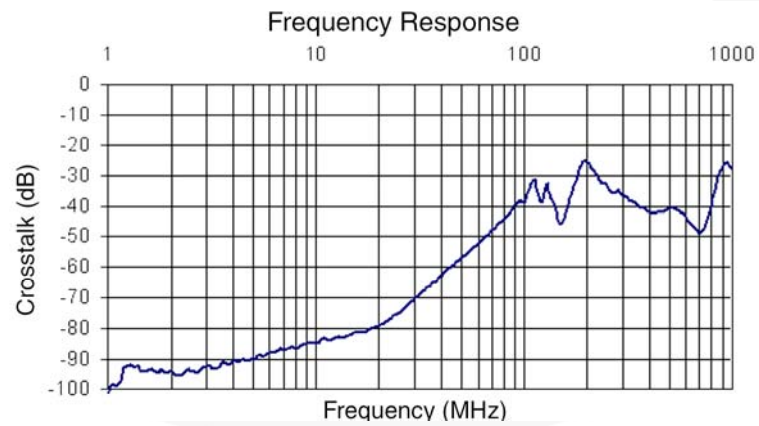
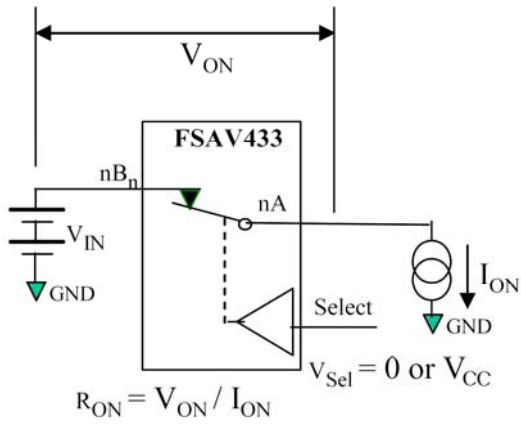
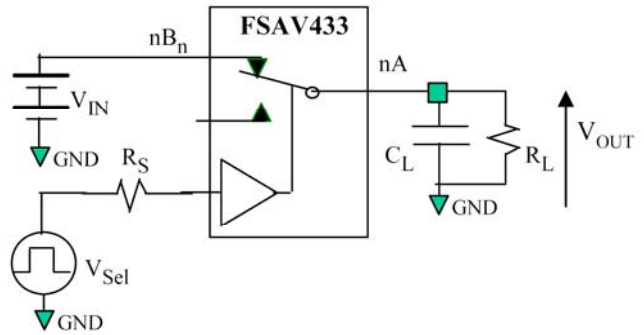


Figure 6. Crosstalk ( $V_{BAIS}=0.5V$ ,  $V_{CC}=3.0V$ ,  $SEL_n=HIGH$ )

**Test Diagrams**



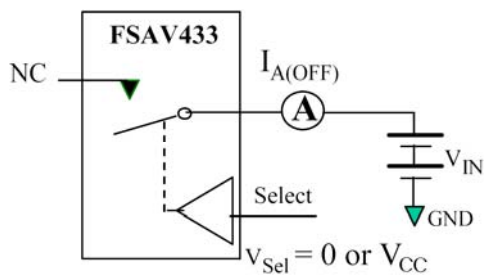
**Figure 7. On Resistance**



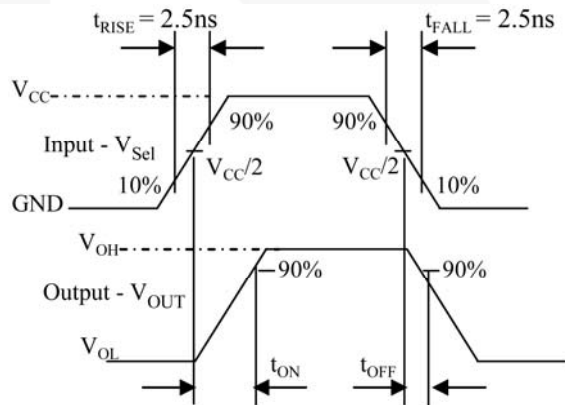
**Note:**

- $R_L$  and  $C_L$  are functions of the application environment (50, 75, or 100Ω)  $C_L$  includes test fixture and stray capacitance.

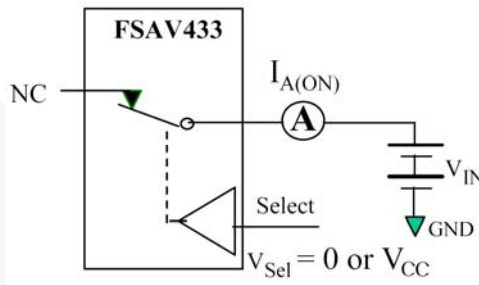
**Figure 8. Test Circuit Load**



**Figure 9. Off Leakage**

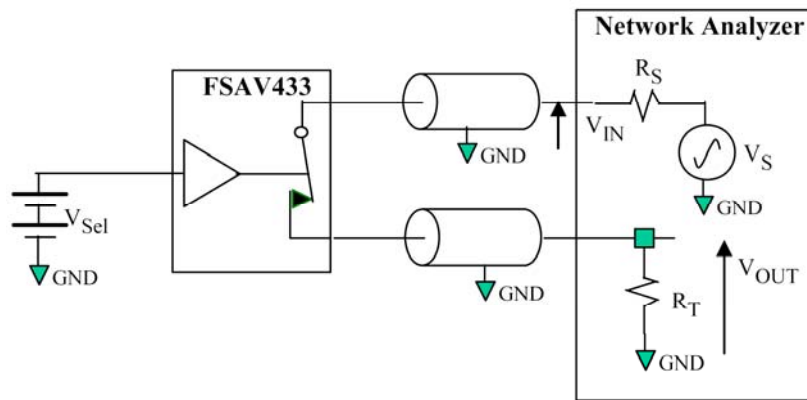


**Figure 10. Turn On / Off Waveforms**



**Figure 11. On Leakage**

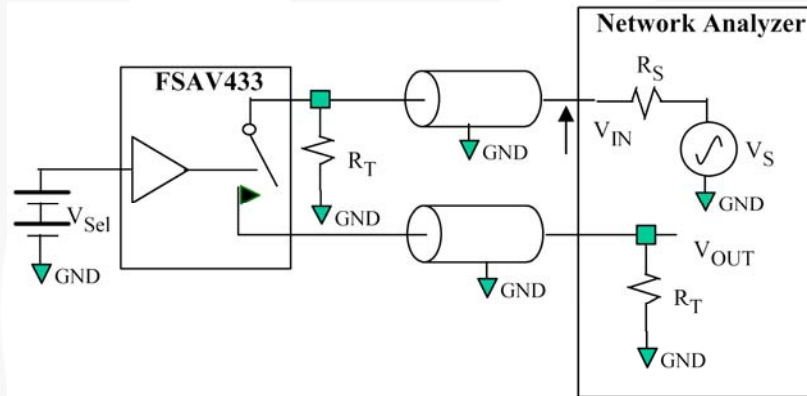
**Test Diagrams (Continued)**



**Notes:**

- 5.  $R_S$  and  $R_T$  are functions of the application environment (50, 75, or 100 $\Omega$ ).

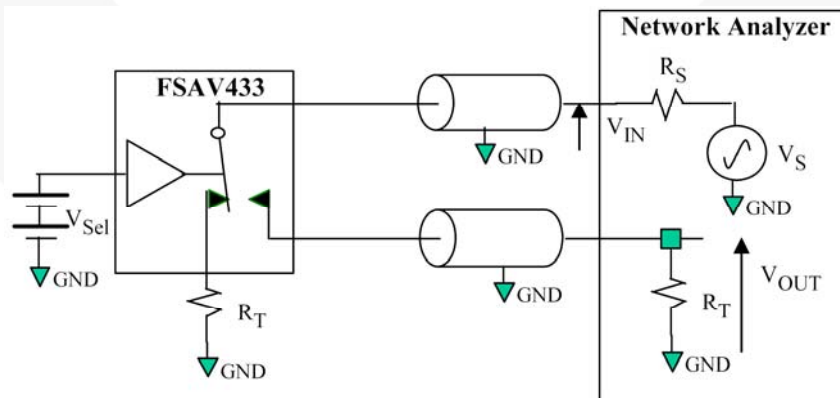
**Figure 12. Bandwidth**



**Notes:**

- 6.  $R_S$  and  $R_T$  are functions of the application environment (50, 75, or 100 $\Omega$ ).
- 7. Off isolation =  $20 \text{ Log } (V_{OUT} / V_{IN})$ .

**Figure 13. Channel Off Isolation**

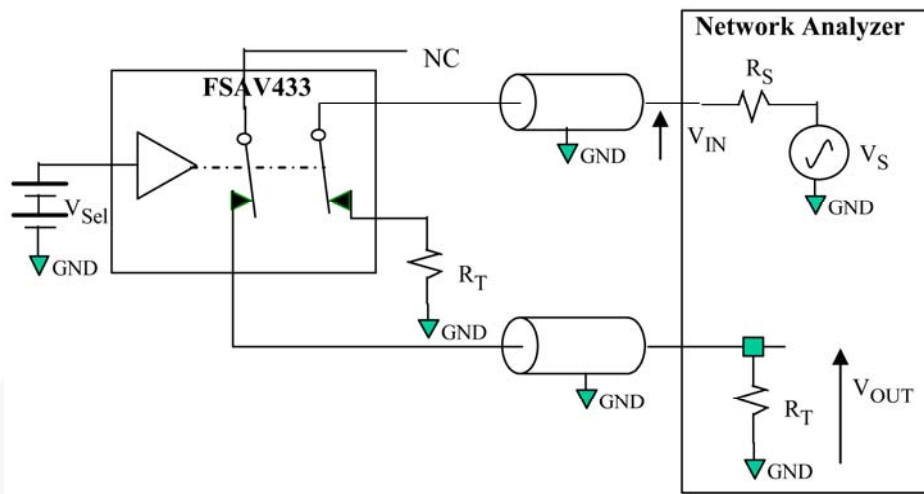


**Note:**

- 8. Crosstalk =  $20 \text{ Log } (V_{OUT} / V_{IN})$ .

**Figure 14. Adjacent Channel Crosstalk**

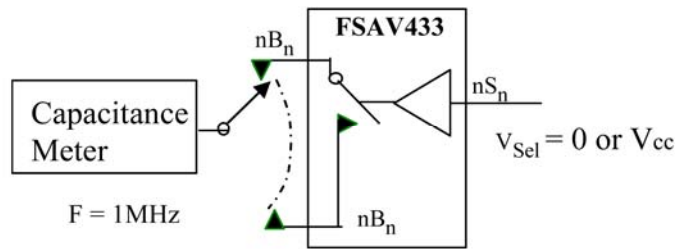
**Test Diagrams (Continued)**



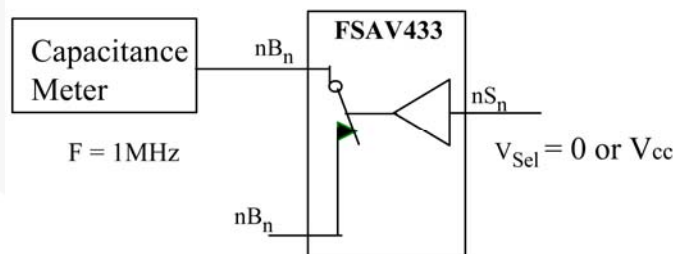
**Notes:**

- 9.  $R_S$  and  $R_T$  are functions of the application environment (50, 75, or 100 $\Omega$ ).
- 10. Crosstalk =  $20 \text{ Log } (V_{OUT} / V_{IN})$ .

**Figure 15. Non-Adjacent Channel-to-Channel Crosstalk**



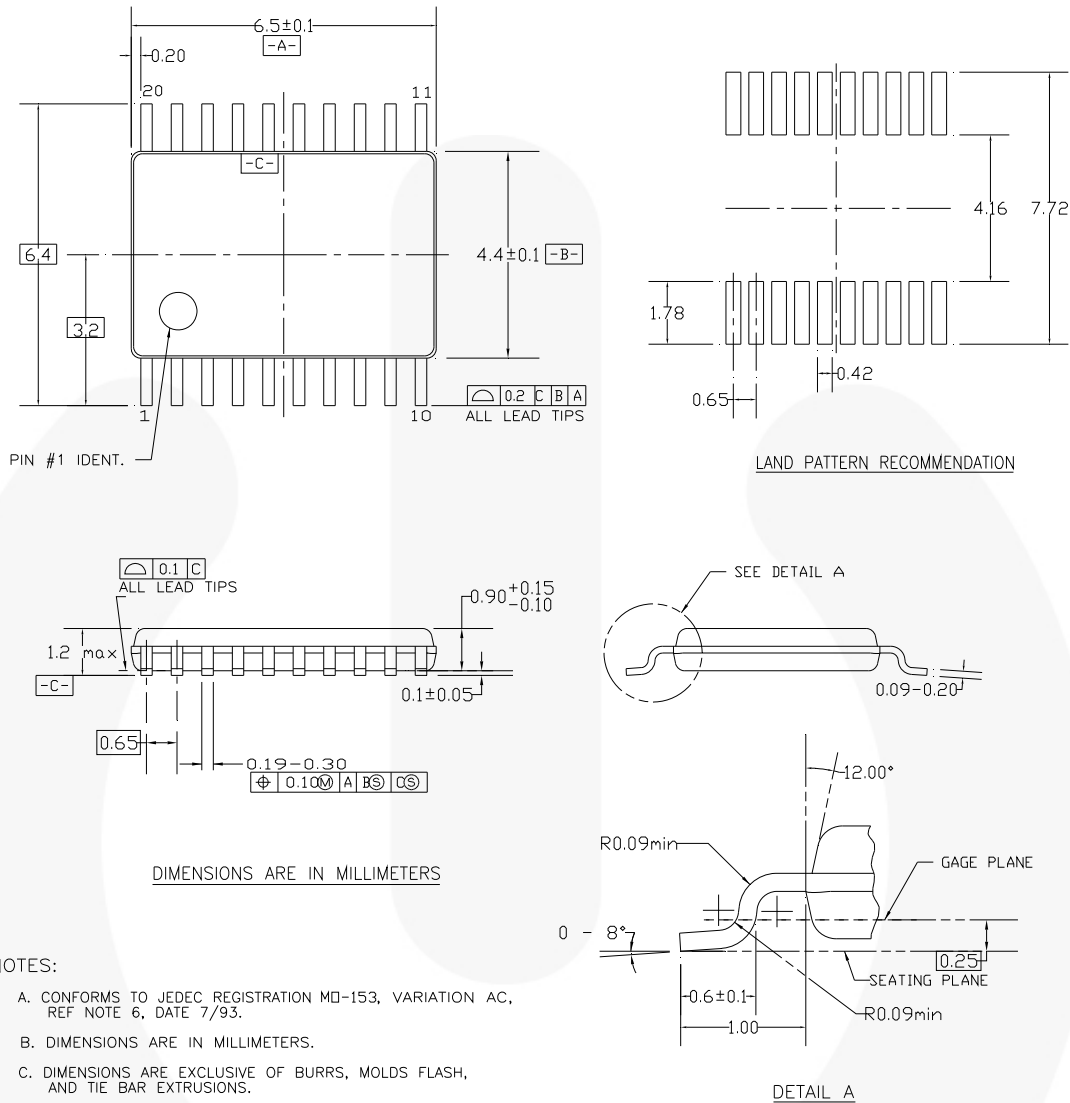
**Figure 16. Channel Off Capacitance**



**Figure 17. Channel On Capacitance**



## Physical Dimensions



MTC20REV D1

**Figure 18. 20-Lead, Thin Shrink Small Outline Package (TSSOP)**

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