FAIRCHILD SEMICONDUCTOR®

January 2011

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

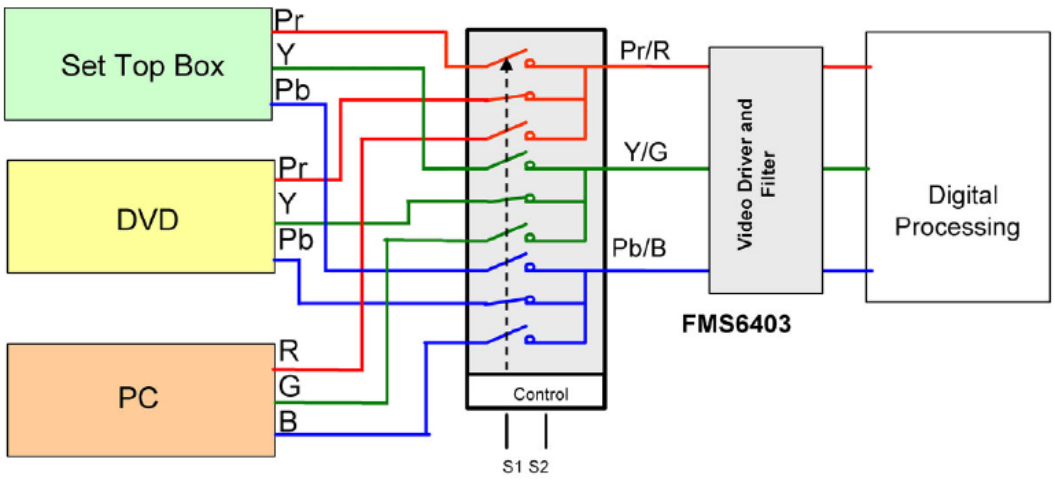


Figure 1. Typical Application Diagram

Pin Configurations

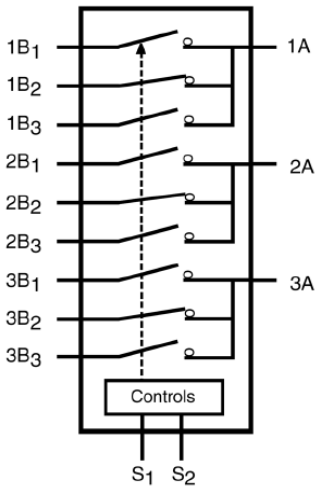


Figure 2. Analog Symbol

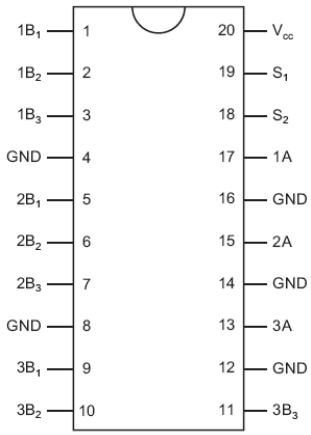


Figure 3. TSSOP Pin Assignments (Top Through View)

Pin Descriptions

Pin #	Name	Description
1, 2, 3, 5, 6, 7, 9, 10, 11	$1B_1$, $2B_2$, $3B_2$	Bus B
4, 8, 12, 14 ,16	GND	Ground
13, 15, 17	1A, 2A, 3A	Bus A
18, 19	S_1, S_2	Select Input
20	V_{CC}	Supply Voltage

Truth Table

S_1	S_2	Function
LOW	LOW	Disconnected
LOW	HIGH	$A=B_1$
HIGH	LOW	$A=B_2$
HIGH	HIGH	$A=B_3$

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	+4.6	V
V_S	DC Switch Voltage	-0.5	V_{CC}+0.5	V
V_{IN}	DC Input Voltage(1)	-0.5	+4.6	V
I_{IK}	DC Input Diode Current, V_{IN}< 0V	-50		mA
I_{OUT}	DC Output Sink Current		100	mA
I_{CC}/I_{GND}	DC V_{CC} / GND Current		±100	mA
T_{STG}	Storage Temperature Range	-65	+150	°C
ESD	Human Body Model, JESD22-A114		7000	V

Note:
1. 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 Operating	2.3	3.6	V
V_{IN}	Input Voltage	0	V_{CC}	V
T_A	Operating Temperature, Free Air	-40	+85	°C

Note:
2. Unused control inputs must be held HIGH or LOW; they may not float.

DC Electrical Characteristics

Typical values are at 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		2.3 to 3.0	0		2	V
V_{IK}	Clamp Diode Voltage	I_{IN}=-18mA	3.0			-1.2	V
V_{IH}	High-Level Input Voltage		2.3	1.8			V
			3.0 to 3.6	2.0			
V_{IL}	Low-Level Input Voltage		2.3			0.8	V
			3.0 to 3.6				
I_I	Input Leakage Current	0 ≤ V_{IN} ≤ 3.6V	3.6			±1.0	µA
I_{OFF}	Off-State Leakage Current	0 ≤ A, B ≤ V_{CC}, See Figure 9	3.6			±1.0	µA
R_{ON}	Switch On Resistance(3)	V_{IN}=1.0V, I_{ON}=13mA, See Figure 7	2.3		9.0	13.0	Ω
			3.0		6.5	9.0	
		V_{IN}=2.0V, I_{ON}=26mA, See Figure 7	2.3		10.0	15.0	
			3.0		6.5	9.0	
I_{CC}	Quiescent Supply Current	V_{IN}=V_{CC} or GND, I_{OUT}=0	3.6			1	µA
I_{CCT}	Increase in I_{CC} per Input	One Control Input at 3.0V Other Inputs at V_{CC} or GND	3.6			10	µA

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}=3.3V and T_A= +25°C.

Symbol	Parameter	Conditions	V_{CC}	T_A=-40 to+85°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=75Ω, f=3.58MHz	3.0 to 3.6		0.2		%	
D_P	Differential Phase	R_L=75Ω, f=3.58MHz	3.0 to 3.6		0.1		°	
O_{IRR}	Non-Adjacent Off Isolation	R_L=75Ω, 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=75Ω, 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=50Ω	3.0 to 3.6		550		MHz	Figure 12
		R_L=75Ω			300			

Capacitance

Typical values are at V_{CC}= 3.3V and T_A=+25°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

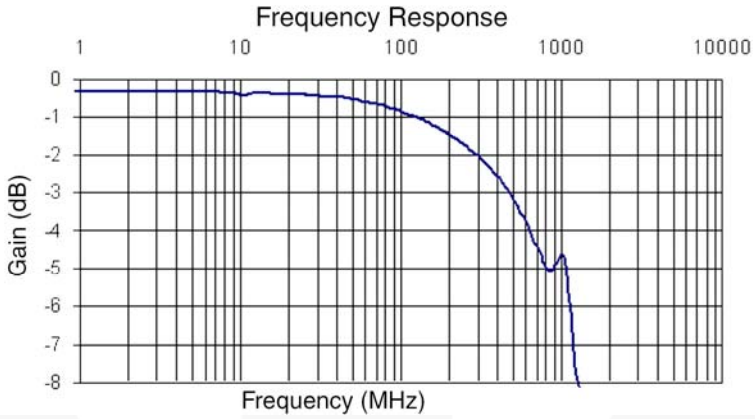


Figure 4. Gain vs. Frequency (V_{BAIS}=0.5V, V_{CC}=3.6V, R_L=50Ω)

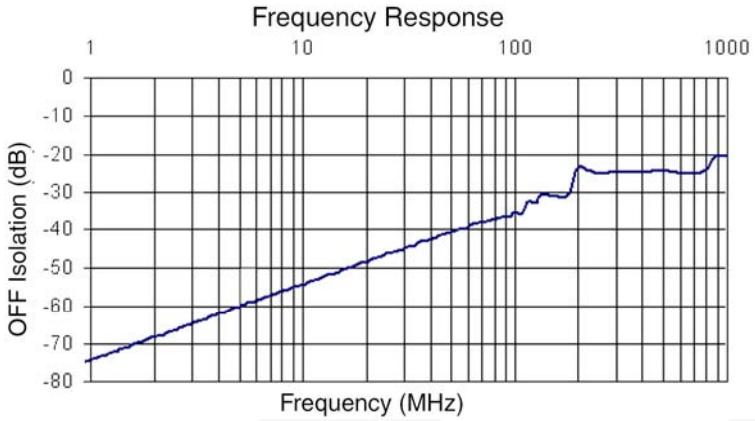


Figure 5. Off Isolation (V_{BAIS}=0.5V, V_{CC}=3. 0V, SEL_n=LOW)

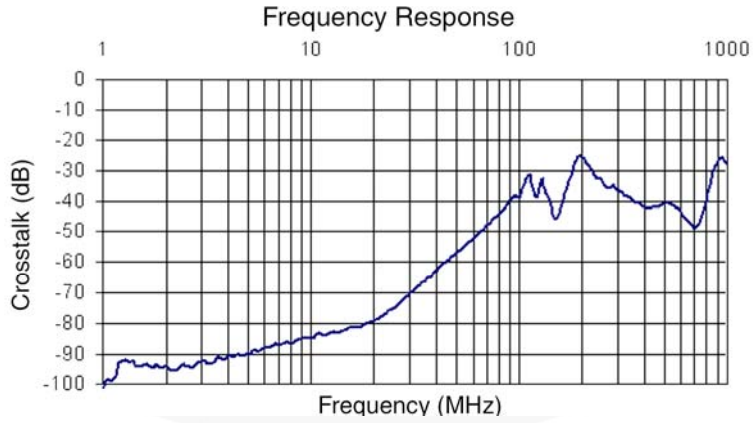


Figure 6. Crosstalk (V_{BAIS}=0.5V, V_{CC}=3. 0V, SEL_n=HIGH)

Test Diagrams

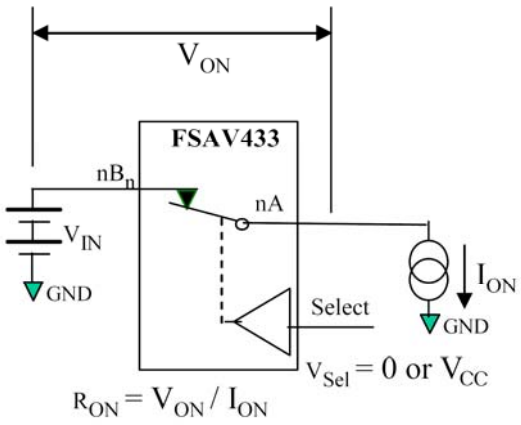
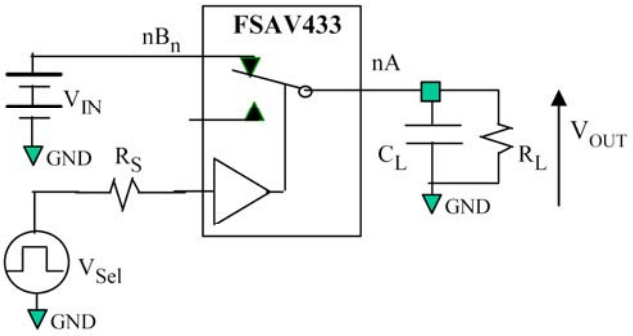


Figure 7. On Resistance



Note:

4. 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

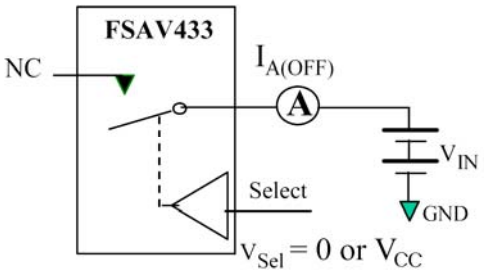


Figure 9. Off Leakage

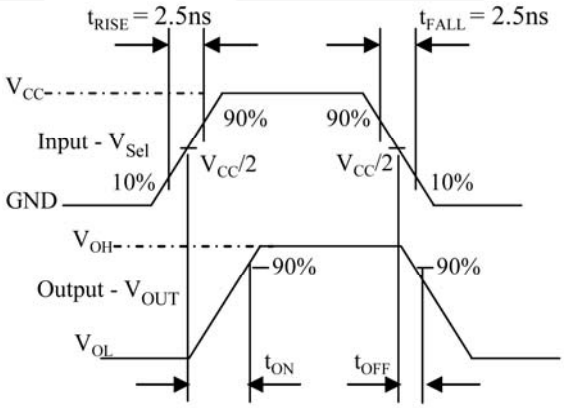


Figure 10. Turn On / Off Waveforms

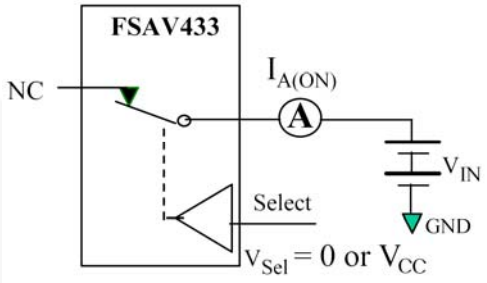
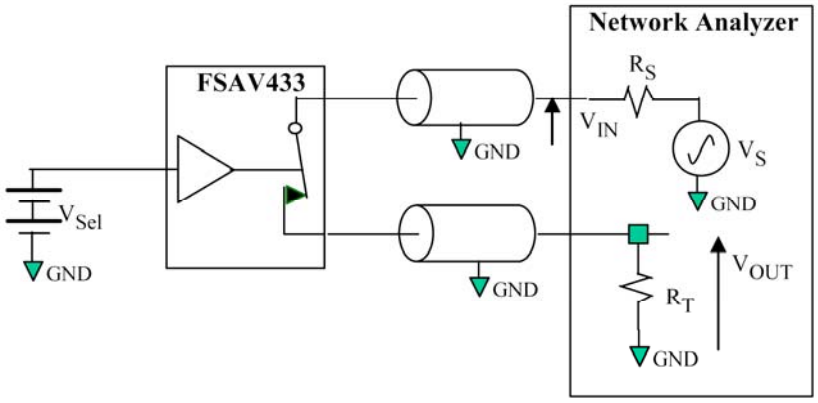


Figure 11. On Leakage

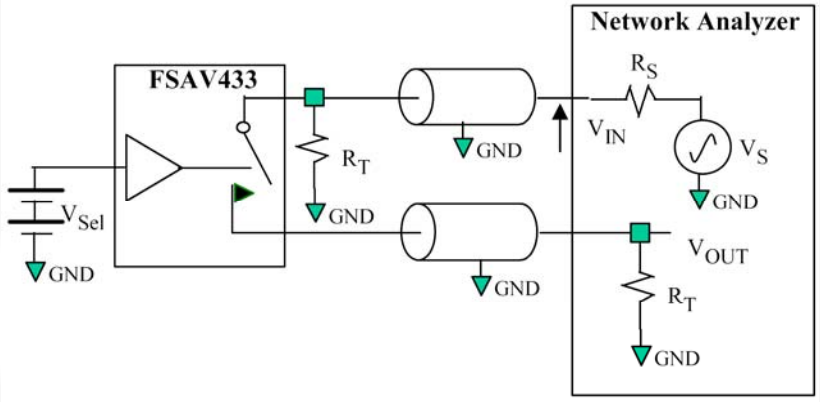
Test Diagrams (Continued)



Notes:

5. R_S and R_T are functions of the application environment (50, 75, or 100Ω).

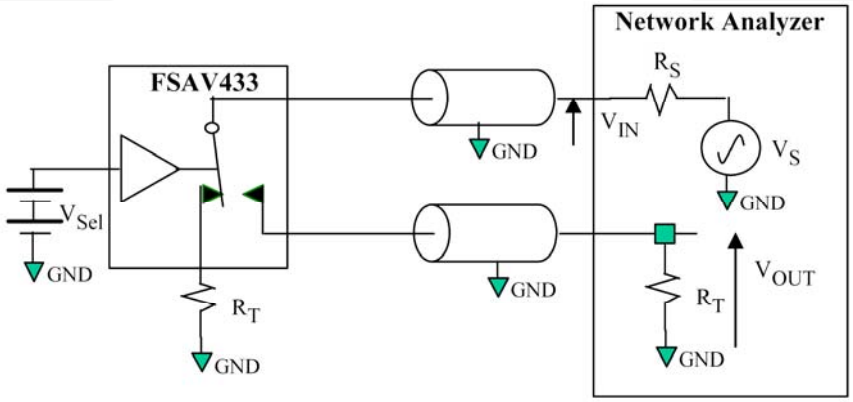
Figure 12. Bandwidth



Notes:

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

Figure 13. Channel Off Isolation

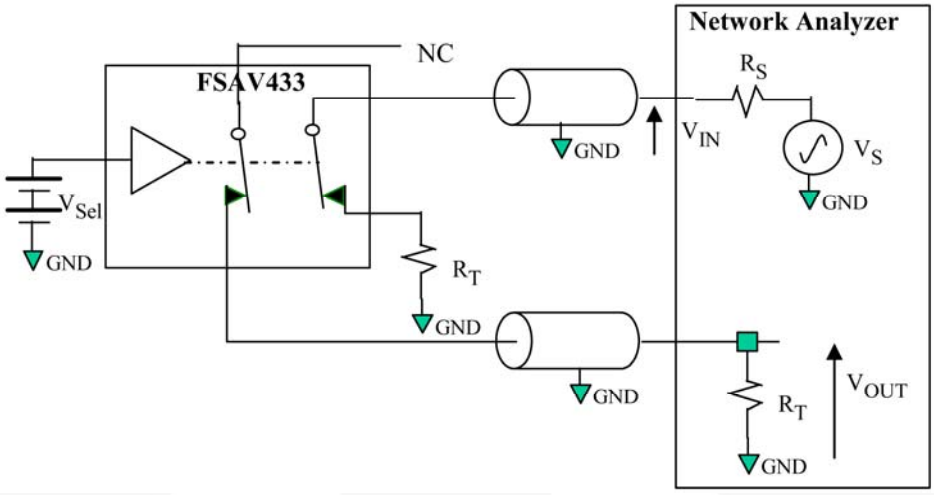


Note:

8. Crosstalk=20 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 100Ω).
10. Crosstalk=20 Log (V_{OUT} / V_{IN}).

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

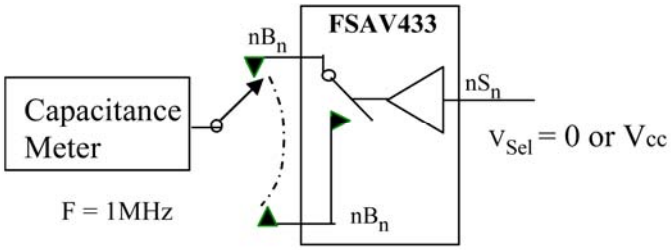


Figure 16. Channel Off Capacitance

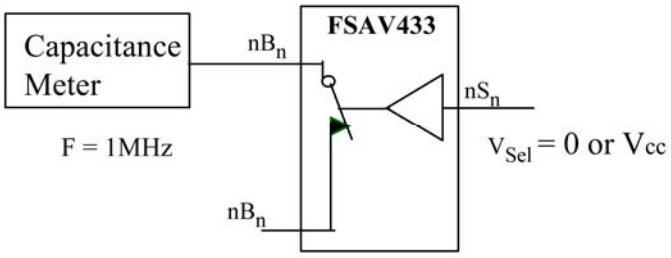


Figure 17. Channel On Capacitance

Physical Dimensions

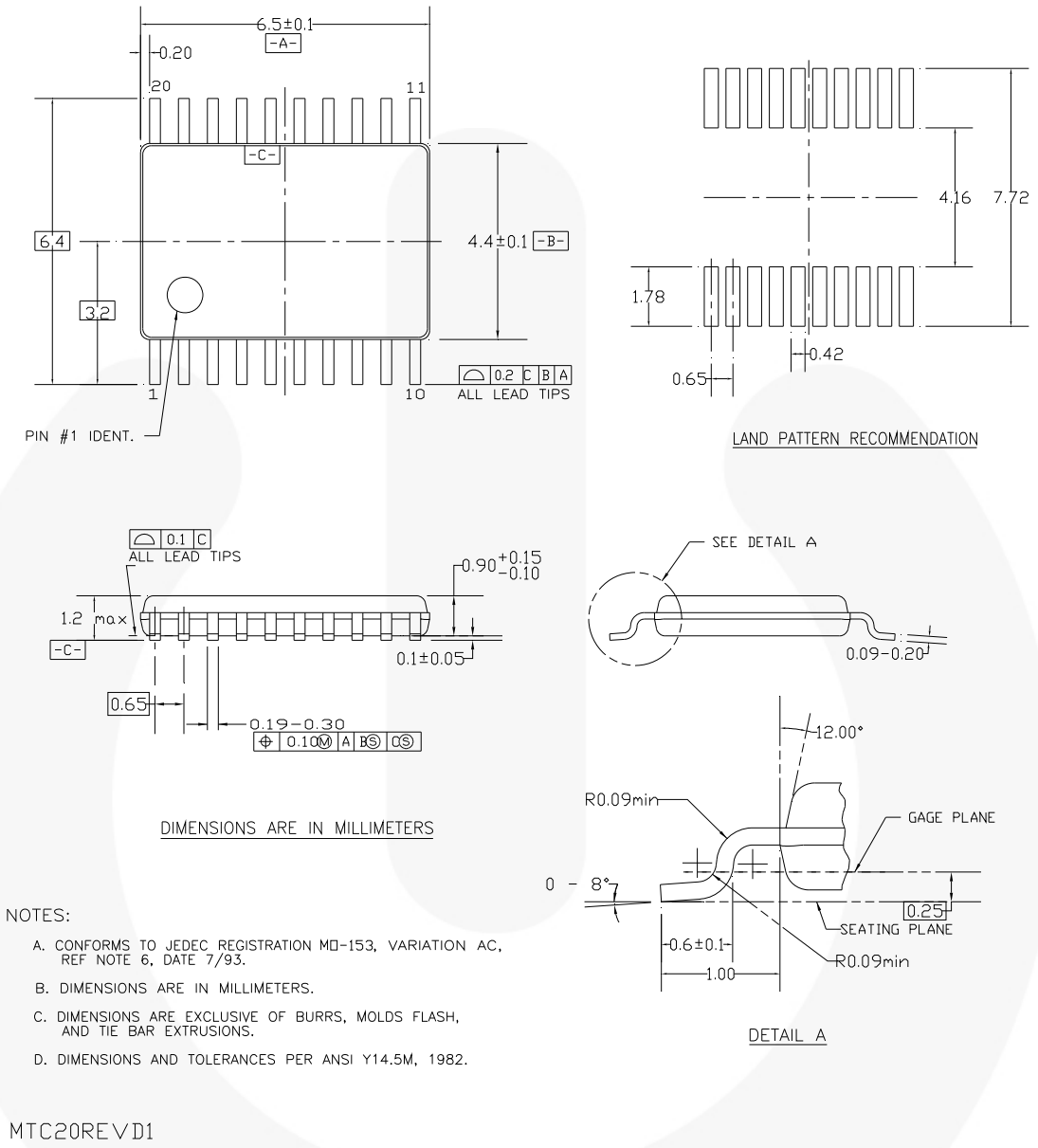


Figure 18. 20-Lead, Thin Shrink Small Outline Package (TSSOP)

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