

## FSAV433

### Low Voltage Ultra Low Power High Bandwidth (550MHz) 3-Port 3:1 Video Switch

#### General Description

The FSAV433 is an ultra low power high bandwidth video switch specially designed for the switching of three analog video signals, including computer RGB and high definition YPbPr signals. The wide bandwidth (550MHz) of this switch allows signal passage with minimum edge and phase distortion while -85dB non-adjacent channel crosstalk generates negligible image noise between active channels. Optimized differential gain and differential phases maintain the image integrity of video applications while low On Resistance offers low signal insertion loss.

#### Features

- Ground between channels to optimize isolation and hostile crosstalk
- -85dB non-adjacent channel crosstalk at 10MHz
- 6.5Ω typical On Resistance ( $R_{ON}$ )
- -3dB bandwidth: 550MHz
- Low power consumption (1uA max)

#### Applications

- RGB Video Switch in LCD, plasma and projection displays
- DVD-RW, notebook

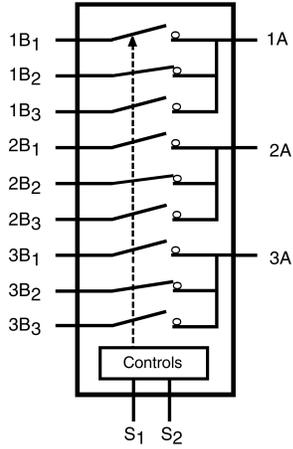
#### Ordering Code:

Order Number	Package Number	Package Description
FSAV433BQX (Preliminary) (Note 1)	MLP020B	Pb-Free 20-Terminal Depopulated Quad Very-Thin Flat Pack No Leads (DQFN), JEDEC MO-241, 2.5 x 4.5mm
FSAV433MTC	MTC20	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering code.  
Pb-Free package per JEDEC J-STD-020B.

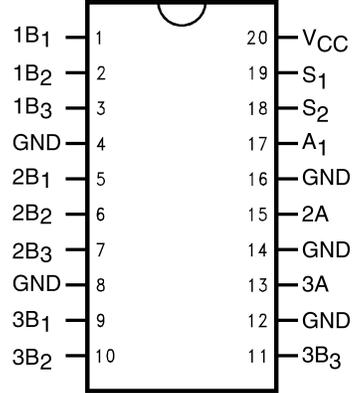
**Note 1:** DQFN package available in Tape and Reel only.

**Analog Symbol**



**Connection Diagrams**

Pin Assignments for TSSOP

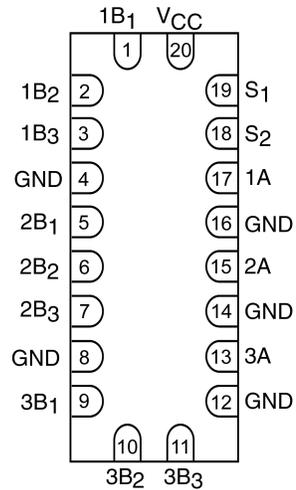


(Top Through View)

**Pin Descriptions**

Pin Name	Description
$\overline{OE}$	Bus Switch Enable
$S_1, S_2$	Select Input
A	Bus A
$B_1-B_3$	Bus B

Pad Assignments for DQFN



(Top Through View)

**Truth Table**

$S_1$	$S_2$	Function
L	L	Disconnect
L	H	$A = B_1$
H	L	$A = B_2$
H	H	$A = B_3$

<b>Absolute Maximum Ratings</b> (Note 2)		<b>Recommended Operating Conditions</b> (Note 4)	
Supply Voltage ( $V_{CC}$ )	-0.5V to +4.6V	Power Supply Operating ( $V_{CC}$ )	2.3V to 3.6V
DC Switch Voltage ( $V_S$ )	-0.5V to $V_{CC} + 0.05V$	Input Voltage ( $V_{IN}$ )	0V to $V_{CC}$
DC Input Voltage ( $V_{IN}$ ) (Note 3)	-0.5V to +4.6V	Free Air Operating Temperature ( $T_A$ )	-40 °C to +85 °C
DC Input Diode Current ( $I_{IK}$ ) $V_{IN} < 0V$	-50 mA		
DC Output ( $I_{OUT}$ ) Sink Current	100 mA		
DC $V_{CC}/GND$ Current ( $I_{CC}/I_{GND}$ )	±100 mA		
Storage Temperature Range ( $T_{STG}$ )	-65°C to +150 °C		
ESD			
Human Body Model	7kV	<p><b>Note 2:</b> The Absolute Maximum Ratings are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum rating. The Recommended Operating Conditions tables will define the conditions for actual device operation.</p> <p><b>Note 3:</b> The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.</p> <p><b>Note 4:</b> Unused control inputs must be held HIGH or LOW. They may not float.</p>	

### DC Electrical Characteristics

Symbol	Parameter	$V_{CC}$ (V)	$T_A = -40\text{ °C to }+85\text{ °C}$			Units	Conditions
			Min	Typ (Note 5)	Max		
	Analog Signal Range		0		2.0	V	
$V_{IK}$	Clamp Diode Voltage	3.0			-1.2	V	$I_{IN} = -18\text{ mA}$
$V_{IH}$	HIGH Level Input Voltage	2.3	1.8			V	
		3.0 - 3.6	2.0				
$V_{IL}$	LOW Level Input Voltage	2.3			0.7	V	
		3.0 - 3.6			0.8		
$I_I$	Input Leakage Current	3.6			±1.0	µA	$0 \leq V_{IN} \leq 3.6V$
$I_{OFF}$	OFF-STATE Leakage Current	3.6			±1.0	µA	$0 \leq A, B \leq V_{CC}$ , See Figure 5
$R_{ON}$	Switch On Resistance (Note 6)	2.3		9.0	13.0	Ω	$V_{IN} = 1.0V$ $I_{ON} = 13\text{ mA}$ , See Figure 4
		3.0		6.5	9.0		
		2.3		10.0	15.0	Ω	$V_{IN} = 2.0V$ $I_{ON} = 26\text{ mA}$ , See Figure 4
		3.0		6.5	9.0		
$I_{CC}$	Quiescent Supply Current	3.6			1.0	µA	$V_{IN} = V_{CC}$ or GND, $I_{OUT} = 0$
$I_{CCT}$	Increase in $I_{CC}$ per Control Input	3.6			10.0	µA	One Control Input at 3.0V Other Inputs at $V_{CC}$ or GND

**Note 5:** Typical values are at  $T_A = +25\text{ °C}$

**Note 6:** Measured by the voltage drop between A and B pins at the indicated current through the switch. On Resistance is determined by the lower of the voltages on the two (A or B) pins.

### AC Electrical Characteristics

Symbol	Parameter	V <sub>CC</sub> (V)	T <sub>A</sub> = -40°C to +85°C			Units	Conditions	Figure Number
			Min	Typ (Note 7)	Max			
t <sub>ON</sub>	Turn ON Time S-to-Bus A	3.0 to 3.6		5.5	ns	V <sub>B</sub> = 2.0V	Figures 7, 8	
		2.3 to 2.7		7.0				
t <sub>OFF</sub>	Turn OFF Time S-to-Bus A	3.0 to 3.6		4.0	ns	V <sub>B</sub> = 2.0V	Figures 7, 8	
		2.3 to 2.7		5.0				
DG	Differential Gain	3.0 to 3.6		0.2	%	R <sub>L</sub> = 75Ω, f = 3.58MHz		
DP	Differential Phase	3.0 to 3.6		0.1	Degree	R <sub>L</sub> = 75Ω, f = 3.58MHz		
O <sub>IRR</sub>	Non-Adjacent OFF-Isolation	3.0 to 3.6		-55.0	dB	f = 10MHz, R <sub>L</sub> = 75Ω	Figure 10	
	Adjacent OFF-Isolation	2.3 to 2.7		-55.0				
X <sub>TALK</sub>	Non-Adjacent Channel Crosstalk	3.0 to 3.6		-85.0	dB	R <sub>L</sub> = 75Ω, f = 10MHz	Figures 11, 12	
	Adjacent Channel Crosstalk	2.3 to 2.7		-85.0				
BW	-3dB Bandwidth	3.0 to 3.6		550	MHz	R <sub>L</sub> = 50Ω	Figure 9	
		3.0 to 3.6		300		R <sub>L</sub> = 75Ω		

Note 7: Typical values are at V<sub>CC</sub> = 3.3V and T<sub>A</sub> = +25°C

### Capacitance

Symbol	Parameter	T <sub>A</sub> = -40°C to +85°C		Units	Conditions	Figure Number
		Typ (Note 8)				
C <sub>IN</sub>	Control Pin Input Capacitance		3.0	pF	V <sub>CC</sub> = 0V	
C <sub>ON</sub>	A/B ON Capacitance		15.0	pF	V <sub>CC</sub> = 3.0V = 0V	Figure 14
C <sub>OFF</sub>	Port B OFF Capacitance		4.0	pF	V <sub>CC</sub> = 3.0V	Figure 13

Note 8: Typical values are at V<sub>CC</sub> = 3.3V and T<sub>A</sub> = +25°C

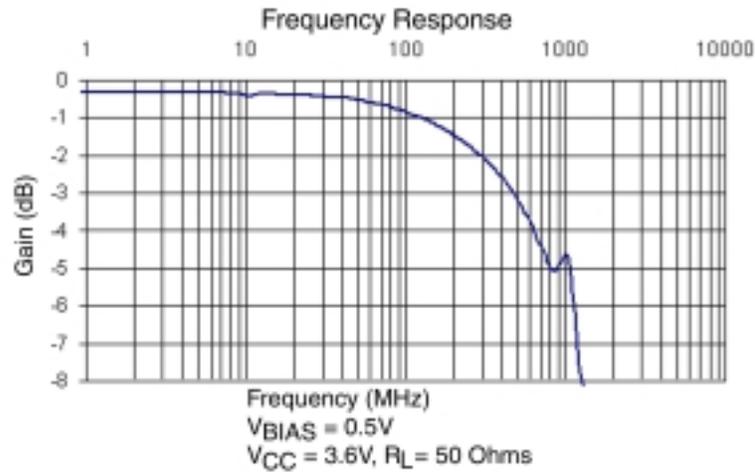


FIGURE 1. Gain vs. Frequency

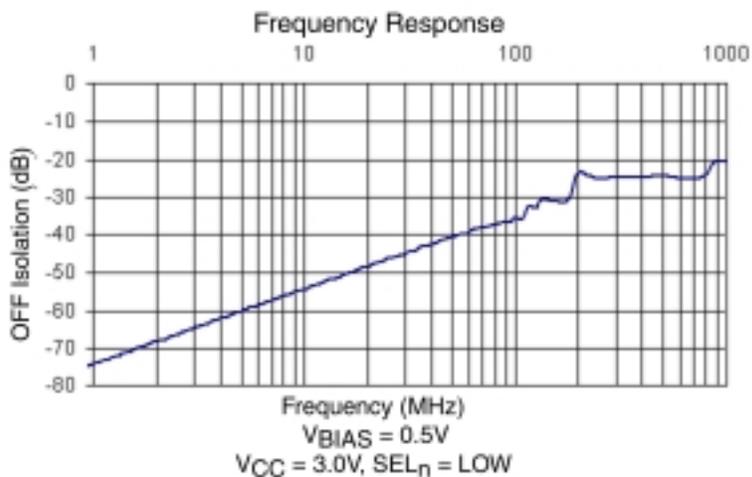


FIGURE 2. OFF Isolation

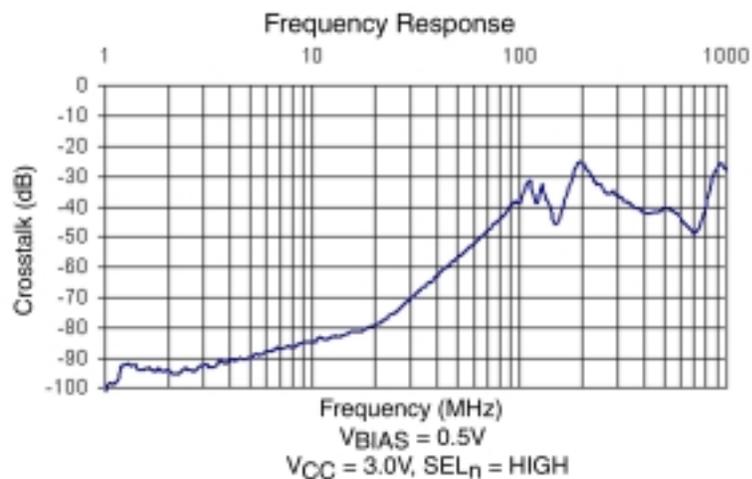


FIGURE 3. Crosstalk

Test Diagrams

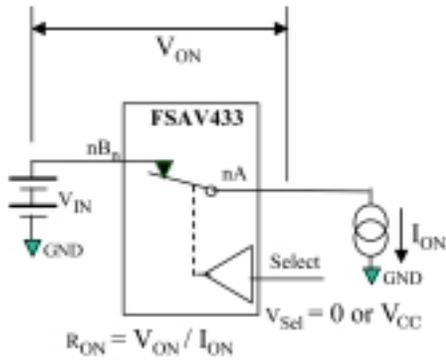


FIGURE 4. On Resistance

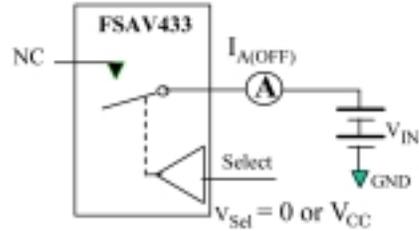


FIGURE 5. OFF Leakage

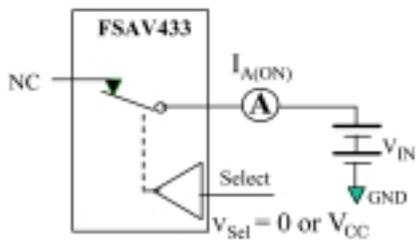
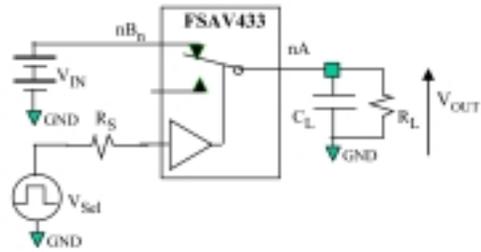


FIGURE 6. ON Leakage



$R_L$  and  $C_L$  are functions of application environment (50, 75, or 100 $\Omega$ )  
 $C_L$  includes test fixture and stray capacitance

FIGURE 7. Test Circuit Load

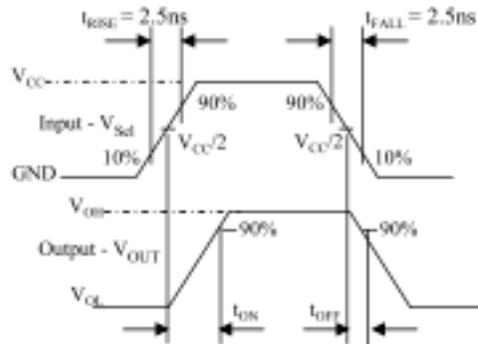
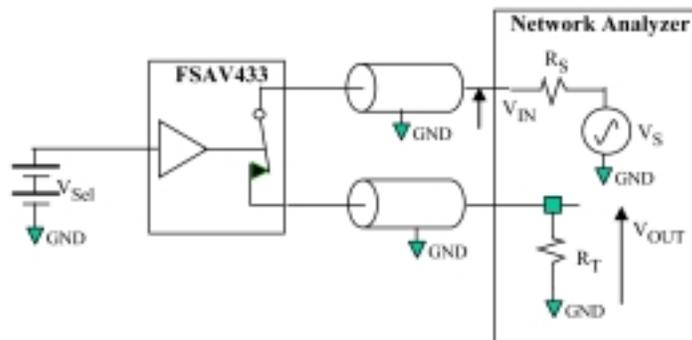


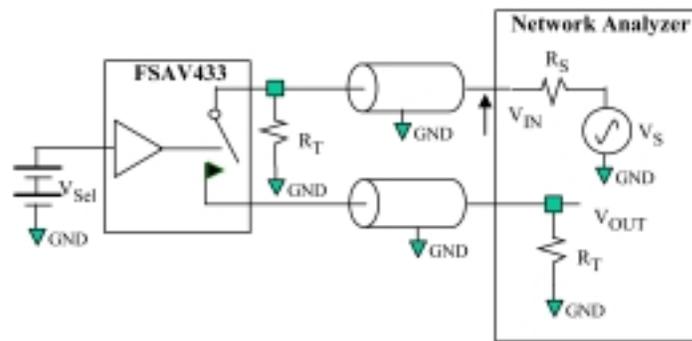
FIGURE 8. Turn ON / Turn OFF Waveforms

Test Diagrams (Continued)



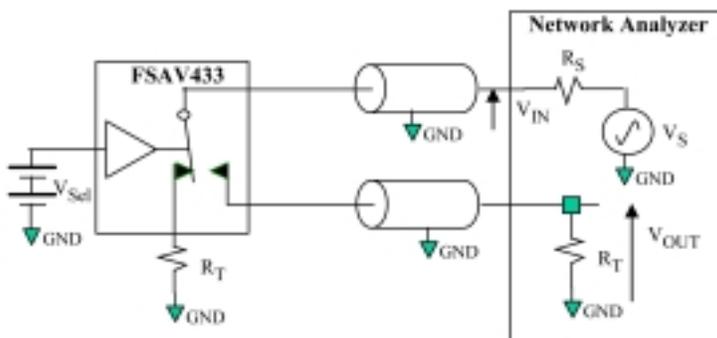
$R_L$  and  $C_L$  are function of application environment (50, 75, or 100 $\Omega$ )  
 $C_L$  includes test fixture and stray capacitance

FIGURE 9. Bandwidth



$R_S$  and  $R_T$  are function of application environment (50, 75, or 100 $\Omega$ )  
 OFF Isolation = 20 Log ( $V_{OUT} / V_{IN}$ )

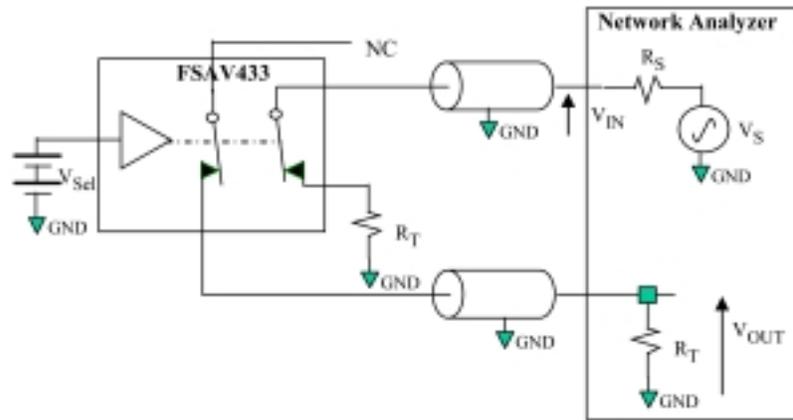
FIGURE 10. Channel OFF Isolation



Crosstalk = 20 Long ( $V_{OUT} / V_{IN}$ )

FIGURE 11. Adjacent Channel Crosstalk

Test Diagrams (Continued)



$R_S$  and  $R_T$  are function of application environment (50, 75, or 100 $\Omega$ )

Crosstalk = 20 Long ( $V_{OUT} / V_{IN}$ )

FIGURE 12. Non-adjacent Channel-to-Channel Crosstalk

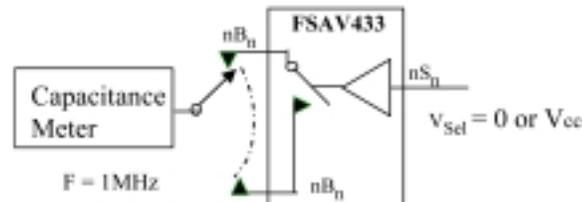


FIGURE 13. Channel OFF Capacitance

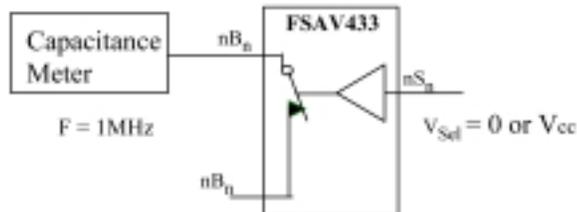


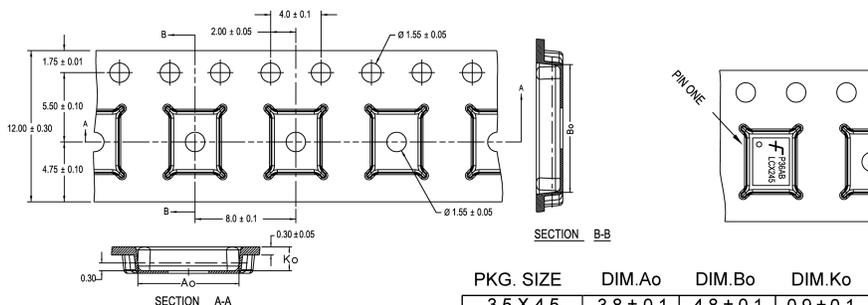
FIGURE 14. Channel ON Capacitance

## Tape and Reel Specification

### Tape Format for DQFN

Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
BQX	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	2500/3000	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed

### TAPE DIMENSIONS inches (millimeters)



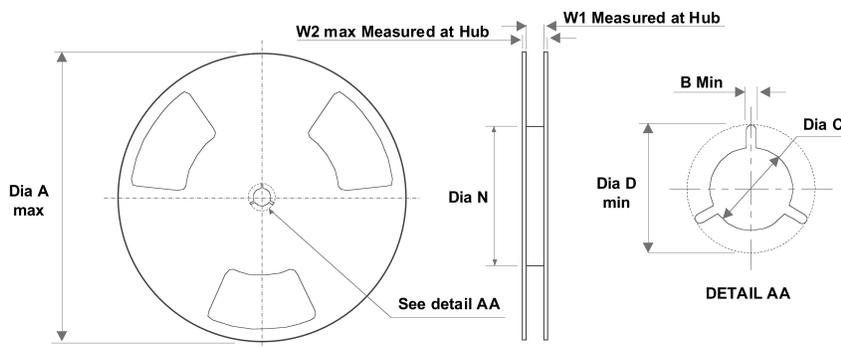
PKG. SIZE	DIM.Ao	DIM.Bo	DIM.Ko
3.5 X 4.5	3.8 ± 0.1	4.8 ± 0.1	0.9 ± 0.1
3.0 X 3.0	3.3 ± 0.1	3.3 ± 0.1	0.9 ± 0.1
2.5 X 4.5	2.8 ± 0.1	4.8 ± 0.1	0.9 ± 0.1
2.5 X 3.5	2.8 ± 0.1	3.8 ± 0.1	0.9 ± 0.1
2.5 X 3.0	2.8 ± 0.1	3.3 ± 0.1	0.9 ± 0.1
2.5 X 2.5	2.8 ± 0.1	2.8 ± 0.1	0.9 ± 0.1

DIMENSIONS ARE IN MILLIMETERS

NOTES: unless otherwise specified

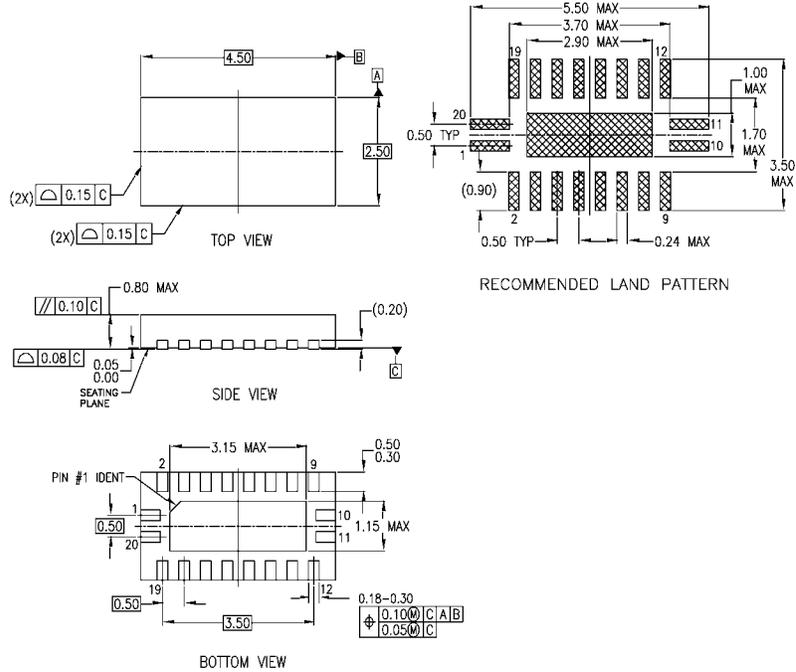
1. Cumulative pitch for feeding holes and cavities (chip pockets) not to exceed 0.008[0.20] over 10 pitch span.
2. Smallest allowable bending radius.
3. Thru hole inside cavity is centered within cavity.
4. Tolerance is  $\pm 0.002[0.05]$  for these dimensions on all 12mm tapes.
5. Ao and Bo measured on a plane 0.120[0.30] above the bottom of the pocket.
6. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
7. Pocket position relative to sprocket hole measured as true position of pocket. Not pocket hole.
8. Controlling dimension is millimeter. Dimension in inches rounded.

### REEL DIMENSIONS inches (millimeters)



Tape Size	A	B	C	D	N	W1	W2
12 mm	13.0 (330)	0.059 (1.50)	0.512 (13.00)	0.795 (20.20)	7.008 (178)	0.488 (12.4)	0.724 (18.4)

**Physical Dimensions** inches (millimeters) unless otherwise noted



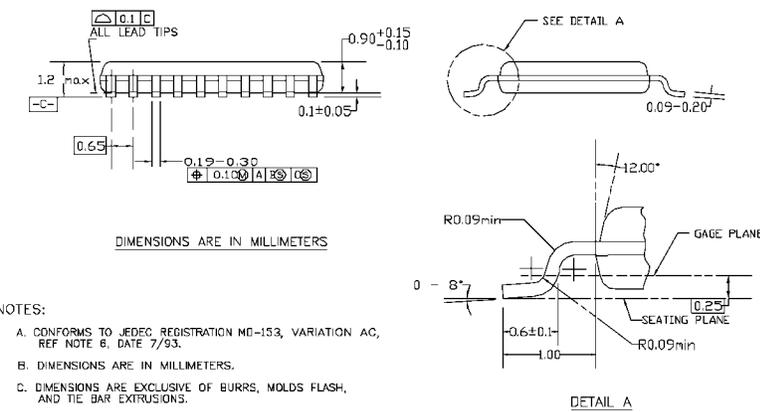
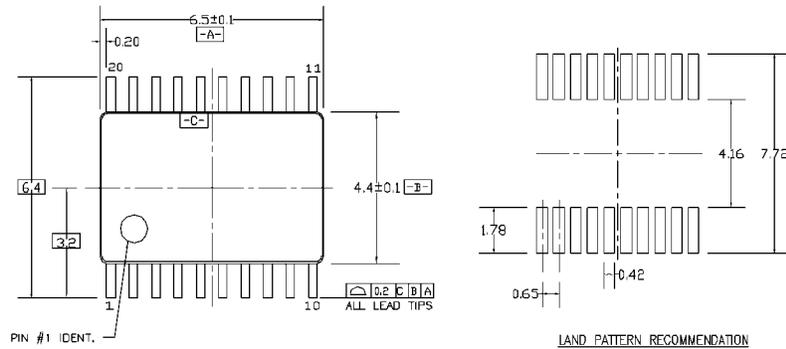
NOTES:

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

MLP020BrevA

**Pb-Free 20-Terminal Depopulated Quad Very-Thin Flat Pack No Leads (DQFN), JEDEC MO-241, 2.5 x 4.5mm  
Package Number MLP020B**

**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



- NOTES:
- A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AC, REF NOTE 6, DATE 7/93.
  - B. DIMENSIONS ARE IN MILLIMETERS.
  - C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLDS FLASH, AND TIE BAR EXTRUSIONS.
  - D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MTC20REV D1

**20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide Package Number MTC20**

**Technology Description**

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

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