

# FSAV433

## High-Bandwidth (550MHz) Three-Channel 3:1 Video Switch

### Features

- Ground between channels to optimize isolation and reduce hostile crosstalk
- -70dB non-adjacent channel crosstalk at 30MHz
- 6.5Ω typical On Resistance (R<sub>ON</sub>)
- -3dB bandwidth: 550MHz
- Low power consumption (1μA max)

### Applications

- RGB Video Switch in LCD, Plasma, and Projection displays
- DVD-RW, notebook

### 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.

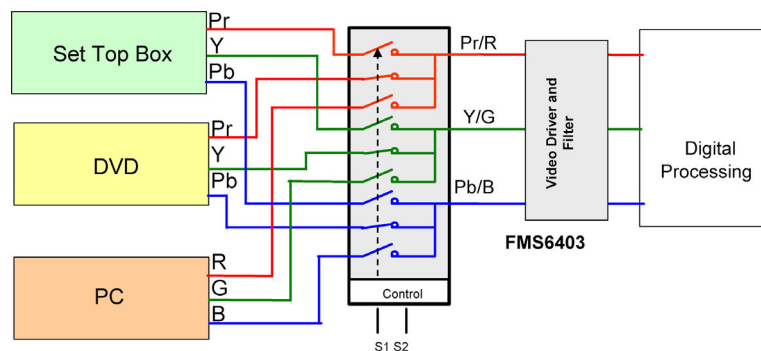
### Ordering Information

Order Number	Package Number	Pb-Free <sup>(1)</sup>	Package Description	Packing Method
FSAV433BQX	MLP020B	Yes	20-Terminal Depopulated Quad Very-Thin Flat Pack No Leads (DQFN), JEDEC MO-241, 2.5 x 4.5mm	Tape & Reel
FSAV433MTC	MTC20	Yes	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide	Tube
FSAV433MTCX	MTC20	Yes	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide	Tape & Reel

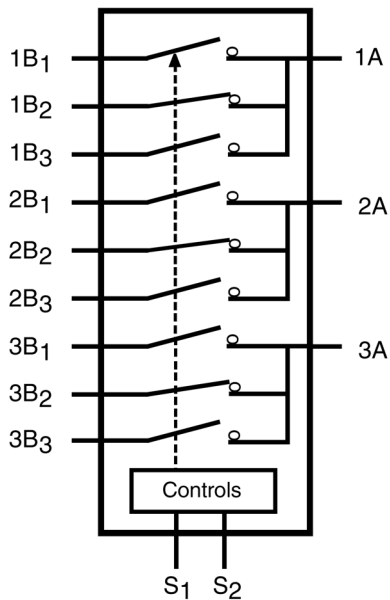
#### Notes:

1. Pb-Free package per JEDEC J-STD-020B.

### Application Diagram



### Analog Symbol



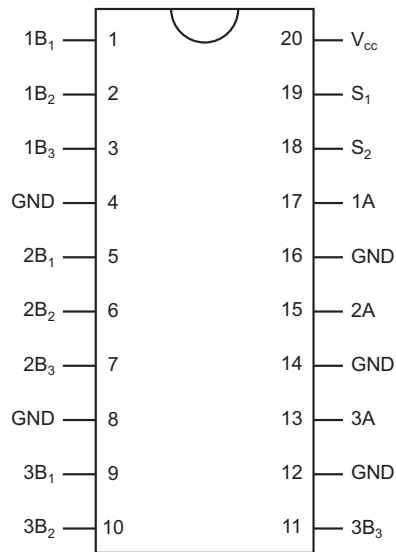
### Pin Descriptions

Pin Name	Description
S <sub>1</sub> , S <sub>2</sub>	Select Input
A	Bus A
B <sub>1</sub> -B <sub>3</sub>	Bus B

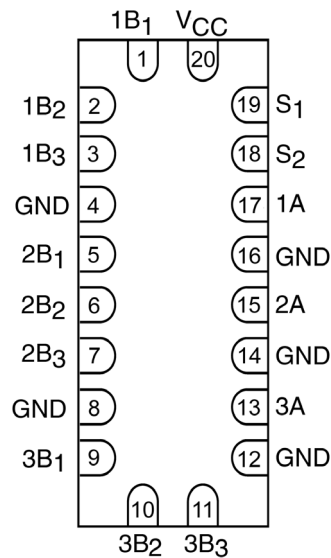
### Truth Table

S <sub>1</sub>	S <sub>2</sub>	Function
Low	Low	Disconnect
Low	High	A = B <sub>1</sub>
High	Low	A = B <sub>2</sub>
High	High	A = B <sub>3</sub>

### Connection Diagrams



**Figure 1. Pin Assignments for TSSOP (Top Through View)**



**Figure 2. Pad Assignments for DQFN (Top Through View)**

## Absolute Maximum Ratings

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 ratings. The "Recommended Operating Conditions" table defines the conditions for actual device operation

Symbol	Parameter	Min.	Max.	Units
$V_{CC}$	Supply Voltage	-0.5	+4.6	V
$V_S$	DC Switch Voltage	-0.5V to $V_{CC}$	+0.05	
$V_{IN}$	DC Input Voltage <sup>(2)</sup>	-0.5 to	+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		$\pm 100$	mA
$T_{STG}$	Storage Temperature Range	-65	+150	$^{\circ}C$
ESD	Human Body Model		7	kV

### Notes:

- The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.

## Recommended Operating Conditions<sup>(3)</sup>

Symbol	Parameter	Min.	Max.	Units
$V_{CC}$	Power Supply Operating	2.3	3.6	V
$V_{IN}$	Input Voltage	0V	$V_{CC}$	
$T_A$	Free Air Operating Temperature	-40	+85	$^{\circ}C$

### Notes:

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

## DC Electrical Characteristics

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

Symbol	Parameter	Conditions	$V_{CC}$ (V)	$T_A = -40^\circ\text{C to } +85^\circ\text{C}$			Units
				Min.	Typ.	Max.	
	Analog Signal Range			0		2.0	V
$V_{IK}$	Clamp Diode Voltage	$I_{IN} = -18\text{ mA}$	3.0			-1.2	V
$V_{IH}$	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	$0 \leq V_{IN} \leq 3.6\text{V}$	3.6			$\pm 1.0$	$\mu\text{A}$
$I_{OFF}$	OFF-STATE Leakage Current	$0 \leq A, B \leq V_{CC}$ , See Figure 7	3.6			$\pm 1.0$	$\mu\text{A}$
$R_{ON}$	Switch On Resistance <sup>(4)</sup>	$V_{IN} = 1.0\text{V}$	2.3		9.0	13.0	$\Omega$
		$I_{ON} = 13\text{ mA}$ , See Figure 6	3.0		6.5	9.0	$\Omega$
		$V_{IN} = 2.0\text{V}$	2.3		10.0	15.0	$\Omega$
		$I_{ON} = 26\text{ mA}$ , See Figure 6	3.0		6.5	9.0	$\Omega$
$I_{CC}$	Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND, $I_{OUT} = 0$	3.6			1.0	$\mu\text{A}$
$I_{CCT}$	Increase in $I_{CC}$ per Control Input	One Control Input at 3.0V Other Inputs at $V_{CC}$ or GND	3.6			10.0	$\mu\text{A}$

### Notes:

- 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

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

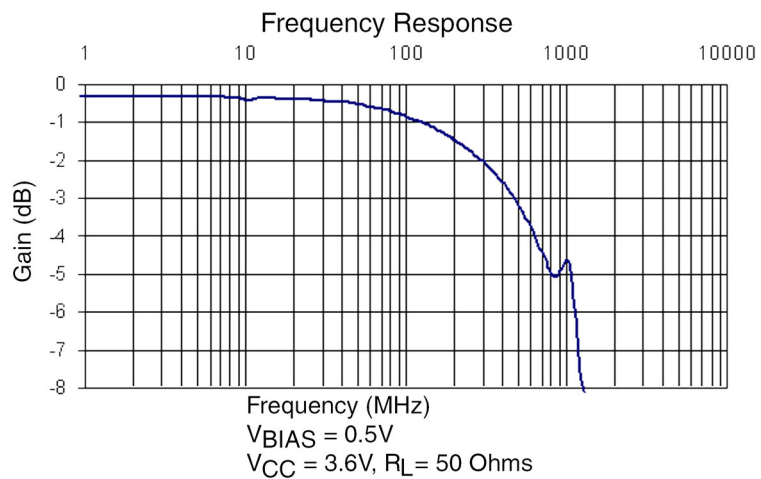
Symbol	Parameter	Conditions	$V_{CC}$ (V)	$T_A = -40^\circ C$ to $+85^\circ C$			Units	Figure Number
				Min.	Typ.	Max.		
$t_{ON}$	Turn ON Time S-to-Bus A	$V_B = 2.0V$	3.0 to 3.6			5.5	ns	Figures 9,10
			2.3 to 2.7			7.0		
$t_{OFF}$	Turn OFF Time S-to-Bus A	$V_B = 2.0V$	3.0 to 3.6			4.0	ns	Figures 9,10
			2.3 to 2.7			5.0		
DG	Differential Gain	$R_L = 75\Omega, f = 3.58MHz$	3.0 to 3.6		0.2		%	
DP	Differential Phase	$R_L = 75\Omega, f = 3.58MHz$	3.0 to 3.6		0.1		°	
$O_{IRR}$	Non-Adjacent OFF-Isolation Adjacent OFF-Isolation	$f = 30MHz, R_L = 75\Omega$	3.0 to 3.6		-45.0		dB	Figure 12
			2.3 to 2.7		-45.0			
$X_{TALK}$	Non-Adjacent Channel Crosstalk Adjacent Channel Crosstalk	$R_L = 75\Omega, f = 30MHz$	3.0 to 3.6		-70.0		dB	Figures 13,14
			2.3 to 2.7		-70.0			
BW	-3dB Bandwidth	$R_L = 50\Omega$	3.0 to 3.6		550		MHz	Figure 11
		$R_L = 75\Omega$	3.0 to 3.6		300			

## Capacitance

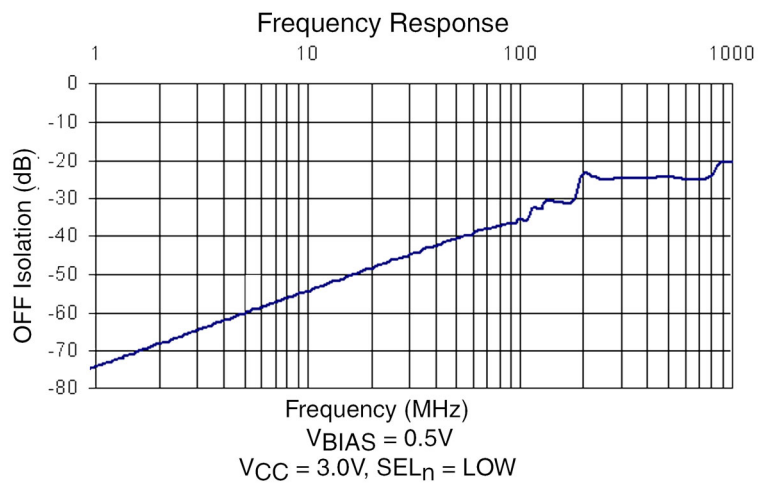
Typical values are at  $V_{CC} = 3.3V$  and  $T_A = +25^\circ C$  unless otherwise specified.

Symbol	Parameter	Conditions	$T_A = -40^\circ C$ to $+85^\circ C$	Units	Figure Number
$C_{IN}$	Control Pin Input Capacitance	$V_{CC} = 0V$	3.0	pF	
$C_{ON}$	A/B ON Capacitance	$V_{CC} = 3.0V = 0V$	15.0	pF	Figure 16
$C_{OFF}$	Port B OFF Capacitance	$V_{CC} = 3.0V$	4.0	pF	Figure 15

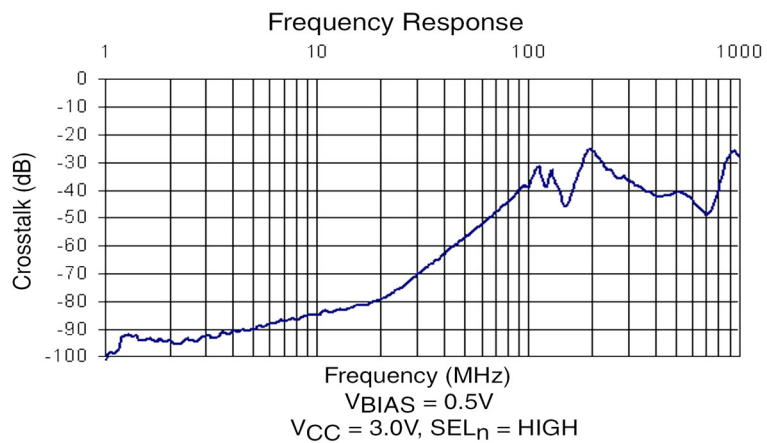
## Typical Characteristics



**Figure 3. Gain vs. Frequency**

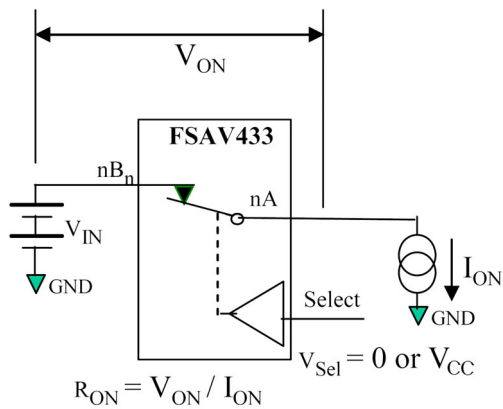


**Figure 4. OFF Isolation**

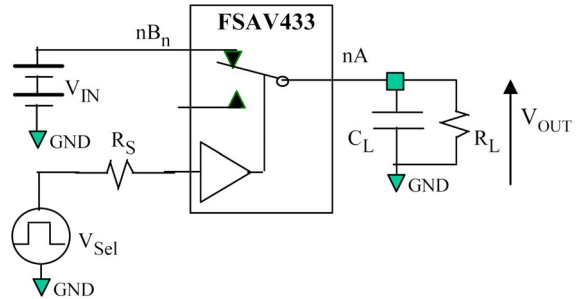


**Figure 5. Crosstalk**

**Test Diagrams**

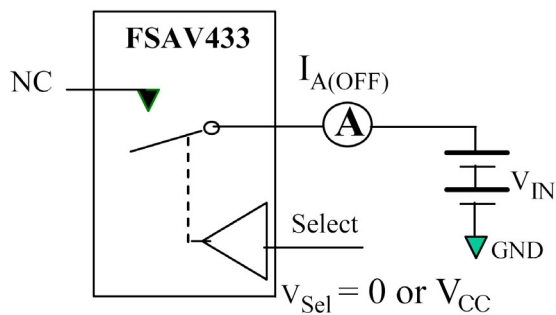


**Figure 6. On Resistance**

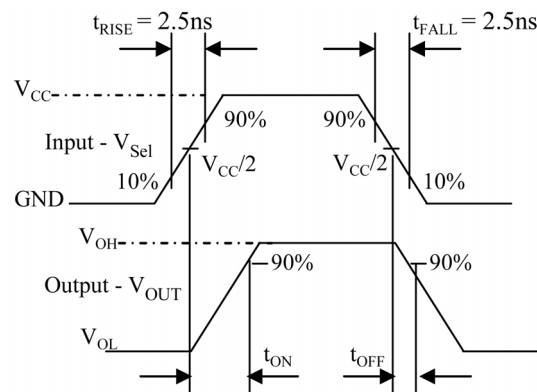


$R_L$  and  $C_L$  are functions of application environment (50, 75, or 100 $\Omega$ )  $C_L$  includes test fixture and stray capacitance

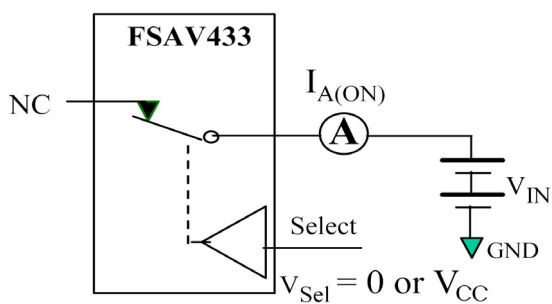
**Figure 9. Test Circuit Load**



**Figure 7. OFF Leakage**

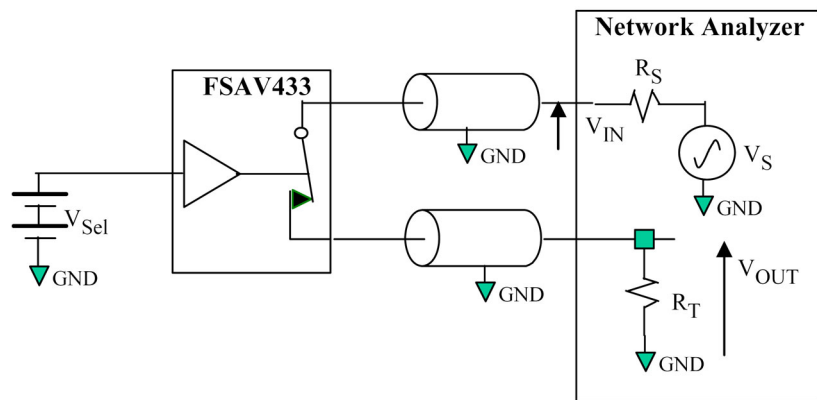


**Figure 10. Turn ON / Turn OFF Waveforms**



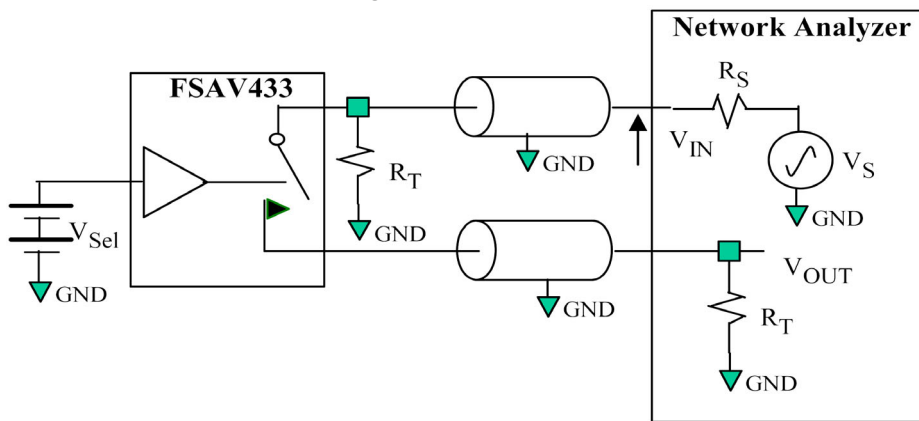
**Figure 8. ON Leakage**

**Test Diagrams**



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

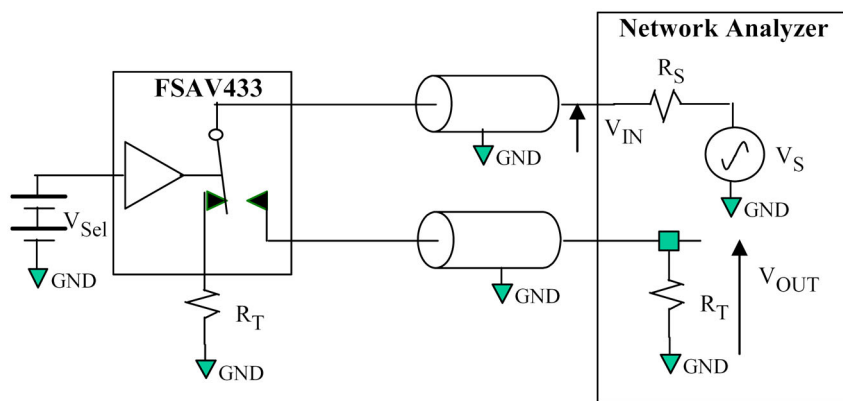
**Figure 11. Bandwidth**



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

$$\text{OFF Isolation} = 20 \text{ Log} (V_{\text{OUT}} / V_{\text{IN}})$$

**Figure 12. Channel OFF Isolation**

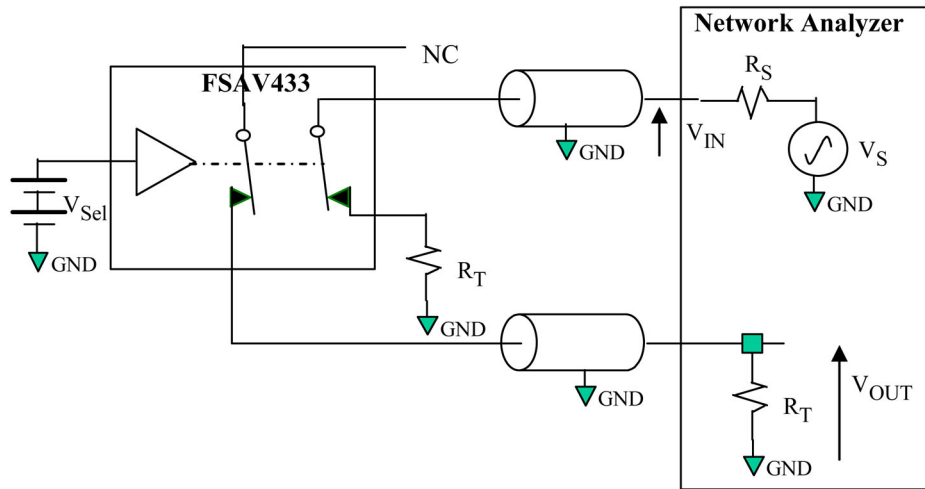


$$\text{Crosstalk} = 20 \text{ Long} (V_{\text{OUT}} / V_{\text{IN}})$$

**Figure 13. Adjacent Channel Crosstalk**



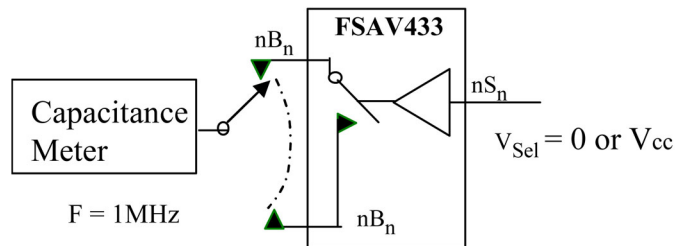
**Test Diagrams (Continued)**



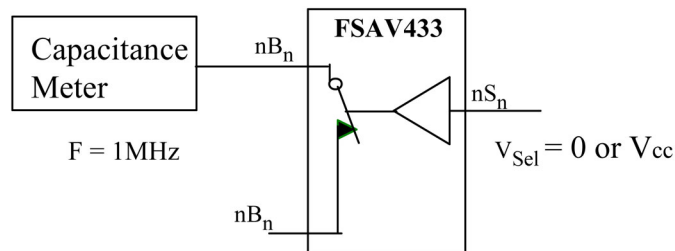
$R_S$  and  $R_T$  are function of application environment (50, 75, or 100 $\Omega$ )

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

**Figure 14. Non-Adjacent Channel-to-Channel Crosstalk**



**Figure 15. Channel OFF Capacitance**



**Figure 16. Channel ON Capacitance**

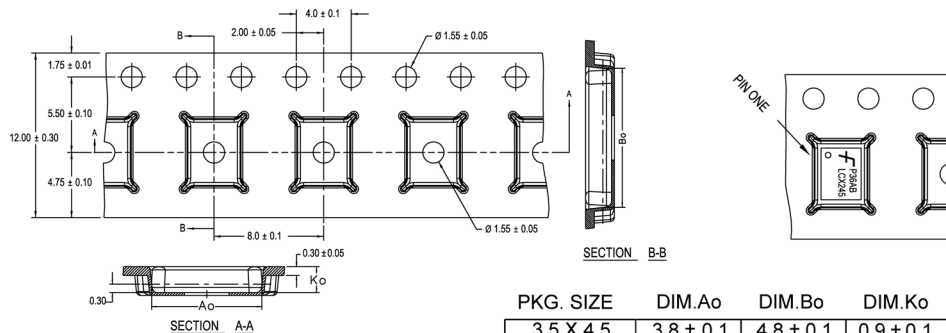
## Tape and Reel Specification

### 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

Dimensions are in millimeters unless otherwise noted.



PKG. SIZE	DIM.A <sub>o</sub>	DIM.B <sub>o</sub>	DIM.K <sub>o</sub>
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

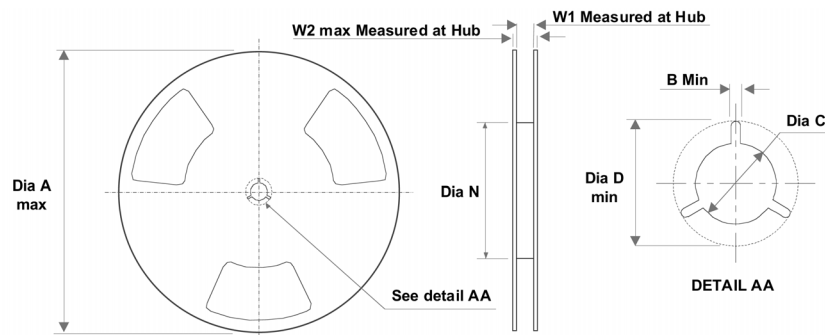
DIMENSIONS ARE IN MILLIMETERS

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 ±0.002[0.05] for these dimensions on all 12mm tapes.
5. A<sub>o</sub> and B<sub>o</sub> measured on a plane 0.120[0.30] above the bottom of the pocket.
6. K<sub>o</sub> 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

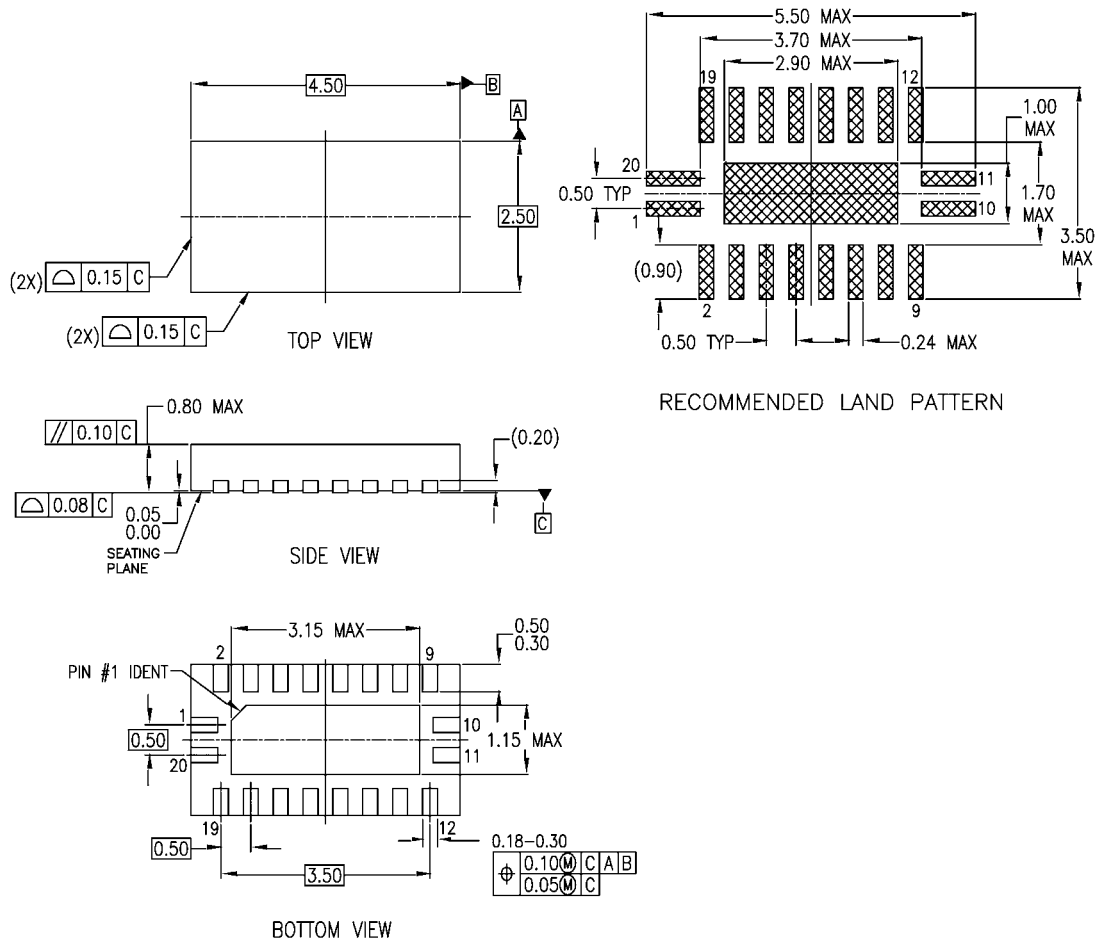
Dimensions are in millimeters unless otherwise noted.



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

Dimensions are in millimeters unless otherwise noted.



### NOTES:

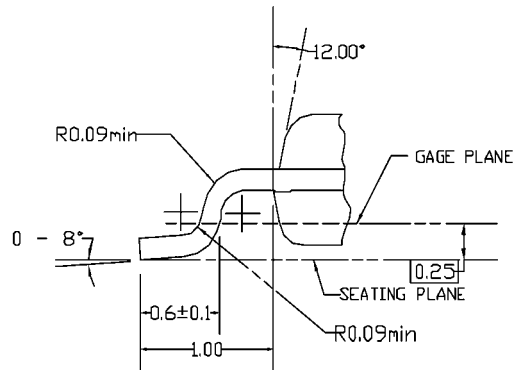
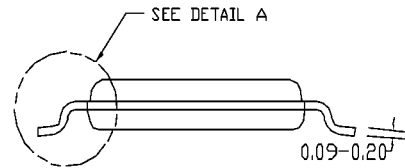
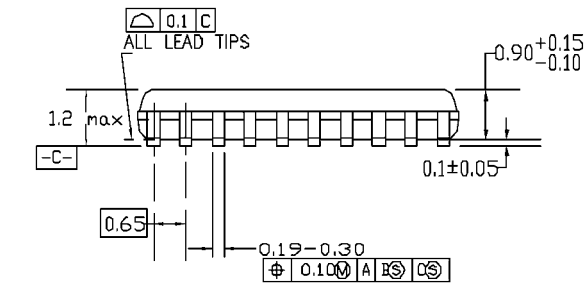
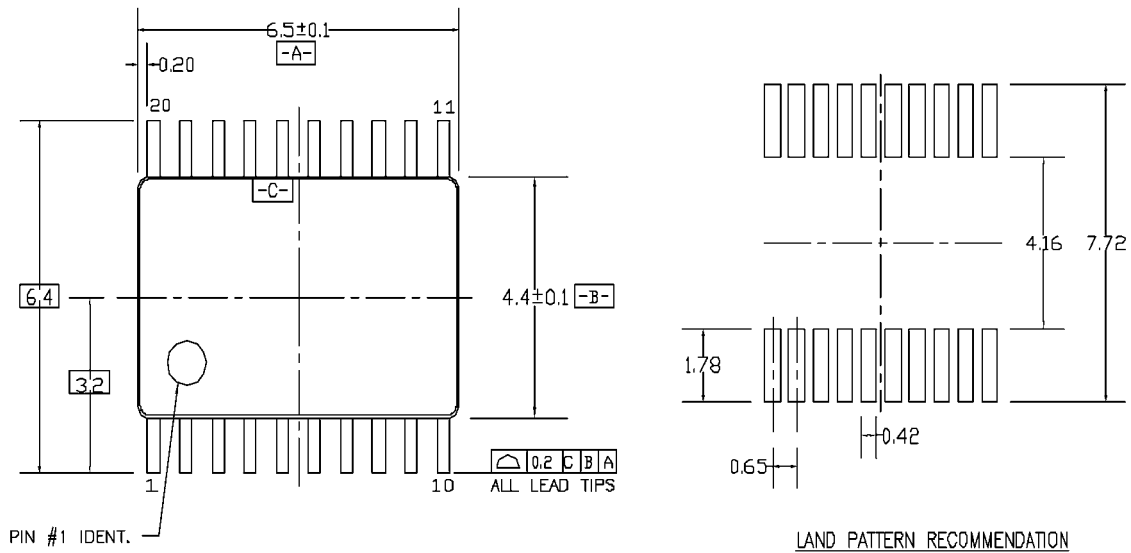
- CONFORMS TO JEDEC REGISTRATION MO-241, VARIATION AC
- DIMENSIONS ARE IN MILLIMETERS.
- DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994

MLP020BrevA

**Figure 17. 20-Terminal Depopulated Quad Very-Thin Flat Pack No Leads (DQFN), JEDEC MO-241, 2.5 x 4.5mm**

### Physical Dimensions (Continued)

Dimensions are in millimeters unless otherwise noted.



DIMENSIONS ARE IN MILLIMETERS

#### 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

**Figure 18. 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide**

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ActiveArray <sup>™</sup>	GlobalOptoisolator <sup>™</sup>	OCXPro <sup>™</sup>	SMART START <sup>™</sup>	UltraFET <sup>®</sup>
Bottomless <sup>™</sup>	GTO <sup>™</sup>	OPTOLOGIC <sup>®</sup>	SPM <sup>™</sup>	VCX <sup>™</sup>
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CoolFET <sup>™</sup>	I <sup>2</sup> C <sup>™</sup>	PACMAN <sup>™</sup>	SuperFET <sup>™</sup>	
CROSSVOLT <sup>™</sup>	i-Lo <sup>™</sup>	POP <sup>™</sup>	SuperSOT <sup>™</sup> _3	
DOME <sup>™</sup>	ImpliedDisconnect <sup>™</sup>	Power247 <sup>™</sup>	SuperSOT <sup>™</sup> _6	
EcoSPARK <sup>™</sup>	IntelliMAX <sup>™</sup>	PowerEdge <sup>™</sup>	SuperSOT <sup>™</sup> _8	
E <sup>2</sup> CMOS <sup>™</sup>	ISOPLANAR <sup>™</sup>	PowerSaver <sup>™</sup>	SyncFET <sup>™</sup>	
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FACT <sup>™</sup>	MICROCOUPLER <sup>™</sup>	QFET <sup>®</sup>	TinyBoost <sup>™</sup>	
FAST <sup>®</sup>	MicroFET <sup>™</sup>	QS <sup>™</sup>	TinyBuck <sup>™</sup>	
FAST <sub>r</sub> <sup>™</sup>	MicroPak <sup>™</sup>	QT Optoelectronics <sup>™</sup>	TinyPWM <sup>™</sup>	
FPS <sup>™</sup>	MICROWIRE <sup>™</sup>	Quiet Series <sup>™</sup>	TinyPower <sup>™</sup>	
FRFET <sup>™</sup>	MSX <sup>™</sup>	RapidConfigure <sup>™</sup>	TinyLogic <sup>®</sup>	
	MSXPro <sup>™</sup>	RapidConnect <sup>™</sup>	TINYOPTO <sup>™</sup>	
Across the board. Around the world. <sup>™</sup>		μSerDes <sup>™</sup>	TruTranslation <sup>™</sup>	
The Power Franchise <sup>®</sup>		ScalarPump <sup>™</sup>	UHC <sup>™</sup>	
Programmable Active Droop <sup>™</sup>				

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

## PRODUCT STATUS DEFINITIONS

### Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

Rev. I20