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# FSA2467

## 0.4Ω Low-Voltage Dual DPDT Analog Switch

### Features

- Typical 0.4Ω On Resistance ( $R_{ON}$ ) for +2.7V Supply
- Features Less than 12μA  $I_{CC}$  Current when Sn Input is Lower than  $V_{CC}$
- 0.25Ω Maximum  $R_{ON}$  Flatness for +2.7V Supply
- 3 x 3mm 16-Lead MLP Package
- 1.8x2.6mm 16-Lead UMLP Package
- Broad  $V_{CC}$  Operating Range
- Low THD (0.02% Typical for 32Ω Load)

### Applications

- Cell Phone
- PDA
- Portable Media Player

### Description

The FSA2467 is a dual Double-Pole, Double-Throw (DPDT) analog switch. The FSA2467 operates from a single 1.65V to 4.3V supply. The FSA2467 features an ultra-low on resistance of 0.4Ω at a +2.7V supply and 25°C. This device is fabricated with sub-micron CMOS technology to achieve fast switching speeds and is designed for break-before-make operation.

FSA2467 features very low quiescent current even when the control voltage is lower than the  $V_{CC}$  supply. This feature allows mobile handset applications direct interface with baseband processor general-purpose I/Os.

### Ordering Information

Part Number	Top Mark	Package Description
FSA2467MPX	FSA 2467	16-lead Molded Leadless Package (MLP), JEDEC MO-220, 3 x 3mm Square
FSA2467UMX	GC	16-lead Ultrathin Molded Leadless Package (UMLP), 1.8 x 2.6mm

### Application Diagram

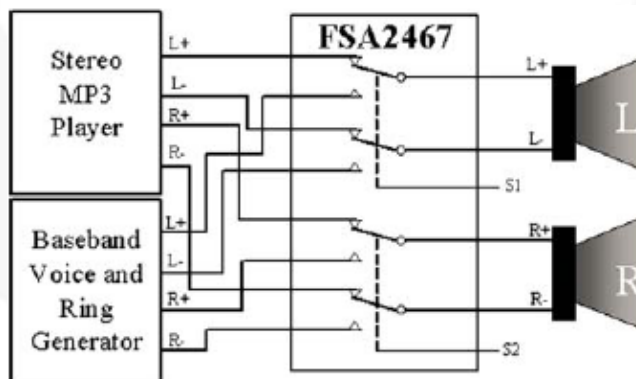


Figure 1. Application Diagram

## Pin Assignments

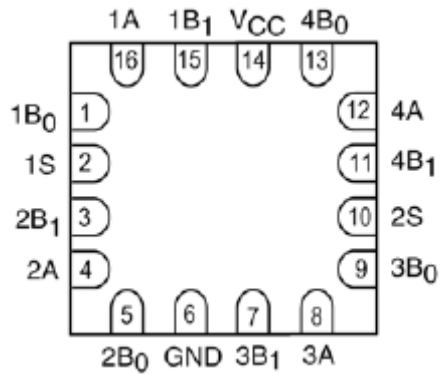


Figure 2. MLP (Top Through View)

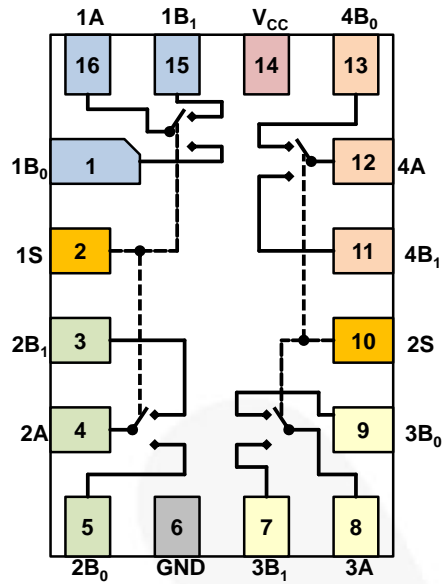


Figure 3. UMLP (Top View)

### Truth Table

Control Inputs	Function
LOW	nB <sub>0</sub> Connected to nA
HIGH	nB <sub>1</sub> Connected to nA

### Pin Descriptions

Name	Function
nA, nB <sub>0</sub> , nB <sub>1</sub>	Data Ports
nS	Control Input

### Analog Symbol

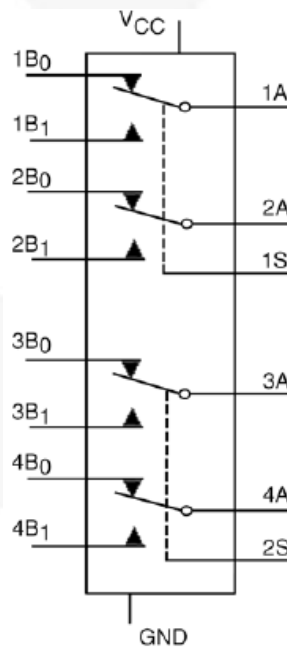


Figure 4. Analog Symbol

## 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	5.0	V
$V_S$	Switch Voltage	-0.5	$V_{CC}+0.3$	V
$V_{IN}$	Input Voltage	-0.5	5.0	V
$I_{IK}$	Input Diode Current	-50		mA
$I_{SW}$	Switch Current		350	mA
$I_{SWPEAK}$	Peak Switch Current (Pulsed at 1ms duration, <10% Duty Cycle)		500	mA
$T_{STG}$	Storage Temperature Range	-65	+150	°C
$T_J$	Junction Temperature		+150	°C
$T_L$	Lead Temperature, Soldering 10 Seconds		+260	°C
ESD	Electrostatic Discharge Capability		5.5	kV
				Human Body Model, JESD22-A114

## 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
$V_{CC}$	Supply Voltage	1.65	4.30	V
$V_{IN}$	Control Input Voltage <sup>(1)</sup>	0	$V_{CC}$	V
$V_S$	Switch Input Voltage	0	$V_{CC}$	V
$T_A$	Operating Temperature	-40	+85	°C

### Note:

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

## DC Electrical Characteristics

Typical values are at 25°C unless otherwise specified.

Symbol	Parameter	Condition	V <sub>CC</sub> (V)	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40 to +85°C		Unit
				Min.	Typ.	Max.	Min	Max.	
V <sub>IH</sub>	Input Voltage High		4.3				1.4		V
			2.7 to 3.6				1.3		
			2.3 to 2.7				1.1		
			1.65 to 1.95				0.9		
V <sub>IL</sub>	Input Voltage Low		4.3					0.7	V
			2.7 to 3.6					0.5	
			2.3 to 2.7					0.4	
			1.65 to 1.95					0.4	
I <sub>IN</sub>	Control Input Leakage	V <sub>IN</sub> =0V to V <sub>CC</sub>	1.65 to 4.30				-0.5	0.5	μA
I <sub>NO(OFF)</sub> I <sub>NC(OFF)</sub>	Off Leakage Current of Port nB <sub>0</sub> and nB <sub>1</sub>	nA=0.3V, V <sub>CC</sub> -0.3V	1.95 to 4.30	-10		10	-50	50	nA
		nB <sub>0</sub> or nB <sub>1</sub> =0.3V, V <sub>CC</sub> -0.3V or floating							
I <sub>A(ON)</sub>	On Leakage Current of Port A	nA=0.3V, V <sub>CC</sub> -0.3V	1.95 to 4.30	-10		10	-50	50	nA
		nB <sub>0</sub> or nB <sub>1</sub> =0.3V, V <sub>CC</sub> -0.3V or Floating							
R <sub>ON</sub>	Switch On Resistance <sup>(2)</sup>	I <sub>OUT</sub> =100mA	4.3		0.4			0.6	Ω
		nB <sub>0</sub> or nB <sub>1</sub> =0V, 0.8V, 1.8V, 2.7V	2.7		0.4			0.6	
		I <sub>OUT</sub> =100mA, nB <sub>0</sub> or nB <sub>1</sub> =0V, 0.7V, 1.2V, 2.3V	2.3	0.55				0.95	
		I <sub>OUT</sub> =100mA, nB <sub>0</sub> or nB <sub>1</sub> =1.0V	1.8	0.8				2.0	
ΔR <sub>ON</sub>	On Resistance Matching Between Channels <sup>(3)</sup>	I <sub>OUT</sub> =100mA, nB <sub>0</sub> or nB <sub>1</sub> =0.8V	2.7	0.04				0.10	Ω
		I <sub>OUT</sub> =100mA, nB <sub>0</sub> or nB <sub>1</sub> =0.7V	2.3	0.03				0.10	
R <sub>FLAT(ON)</sub>	On Resistance Flatness <sup>(4)</sup>	I <sub>OUT</sub> =100mA, B <sub>0</sub> or nB <sub>1</sub> =0V to V <sub>CC</sub>	2.7					0.25	Ω
			2.3					0.3	
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> =0V to V <sub>CC</sub> I <sub>OUT</sub> =0V	4.3	-100		100	-500	500	nA
I <sub>CCT</sub>	Increase in I <sub>CC</sub> Current per Control Voltage	V <sub>IN</sub> =1.8V	4.3		7	12		15	μA
		V <sub>IN</sub> =2.6V	4.3		3	6		7	

### Notes:

- On resistance is determined by the voltage drop between A and B pins at the indicated current through the switch.
- Δ R<sub>ON</sub>=R<sub>ON max</sub> - R<sub>ON min</sub> measured at identical V<sub>CC</sub>, temperature and voltage.
- Flatness is defined as the difference between the maximum and minimum value of on resistance over the specified range of conditions.

## AC Electrical Characteristics

Typical values are at 25°C unless otherwise specified.

Symbol	Parameter	Condition	V <sub>CC</sub>	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40 to +85°C		Unit	Figure
				Min.	Typ.	Max.	Min.	Max.		
t <sub>ON</sub>	Turn-On Time	nB0 or nB1=1.5V	3.6 to 4.3			50		60	ns	Figure 8
		R <sub>L</sub> =50Ω, C <sub>L</sub> =35pF	2.7 to 3.6			65		75		
			2.3 to 2.7			80		90		
t <sub>OFF</sub>	Turn-Off Time	nB0 or nB1=1.5V	3.6 to 4.3			32		40	ns	Figure 8
		R <sub>L</sub> =50Ω, C <sub>L</sub> =35pF	2.7 to 3.6			42		50		
			2.3 to 2.7			52		60		
t <sub>BBM</sub>	Break-Before-Make Time	nB0 or nB1=1.5V	3.6 to 4.3		12				ns	Figure 9
		R <sub>L</sub> =50Ω, C <sub>L</sub> =35pF	2.7 to 3.6		15					
			2.3 to 2.7		20					
Q	Charge Injection	C <sub>L</sub> =100pF, V <sub>GEN</sub> =0V, R <sub>GEN</sub> =0Ω	3.6 to 4.3		15				pC	Figure 11
		C <sub>L</sub> =100pF, V <sub>GEN</sub> =0V, R <sub>GEN</sub> =0Ω	2.7 to 3.6		10					
		C <sub>L</sub> =100pF, V <sub>GEN</sub> =0V, R <sub>GEN</sub> =0Ω	2.3 to 2.7		8					
OIRR	Off Isolation	f=100KHz, R <sub>L</sub> =50Ω, C <sub>L</sub> =5pF	3.6 to 4.3		-75				dB	Figure 10
			2.7 to 3.6		-75					
			2.3 to 2.7		-75					
Xtalk	Crosstalk	f=100KHz, R <sub>L</sub> =50Ω, C <sub>L</sub> =5pF	3.6 to 4.3		-75				dB	Figure 10
			2.7 to 3.6		-75					
			2.3 to 2.7		-75					
BW	-3dB Bandwidth	R <sub>L</sub> =50Ω	2.3 to 4.3		85				MHZ	Figure 13
THD	Total Harmonic Distortion	R <sub>L</sub> =32Ω, V <sub>IN</sub> =2V <sub>PP</sub> , f=20 to 20kHz	3.6 to 4.3		0.02				%	Figure 14
		R <sub>L</sub> =32Ω, V <sub>IN</sub> =2V <sub>PP</sub> , f=20 to 20kHz	2.7 to 3.6		0.02					
		R <sub>L</sub> =32Ω, V <sub>IN</sub> =2V <sub>PP</sub> , f=20 to 20kHz	2.3 to 2.7		0.02					

## Capacitance

Symbol	Parameter	Condition	V <sub>CC</sub>	T <sub>A</sub> = +25°C Typical	Unit	Figure
C <sub>IN</sub>	Control Pin Input Capacitance	f=1MHZ	0	1.5	pF	Figure 8
C <sub>OFF</sub>	B Port Off Capacitance	f=1MHZ	3.3	32	pF	Figure 8
C <sub>ON</sub>	A Port On Capacitance	f=1MHZ	3.3	118	pF	Figure 8

Typical Applications

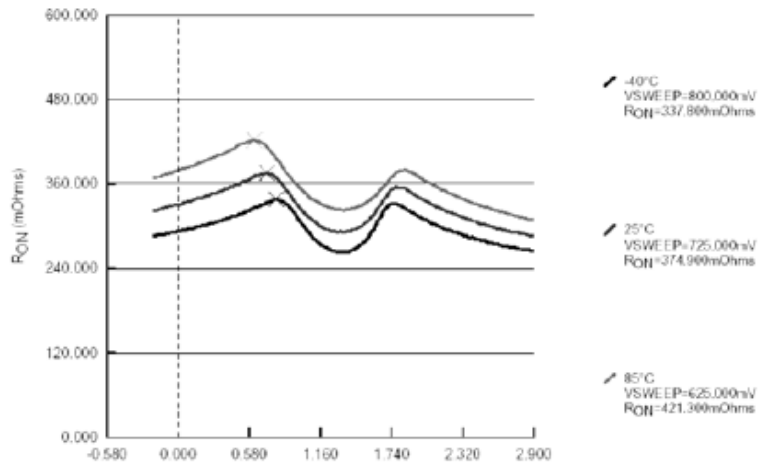


Figure 5.  $R_{ON}$  at 2.7V  $V_{CC}$

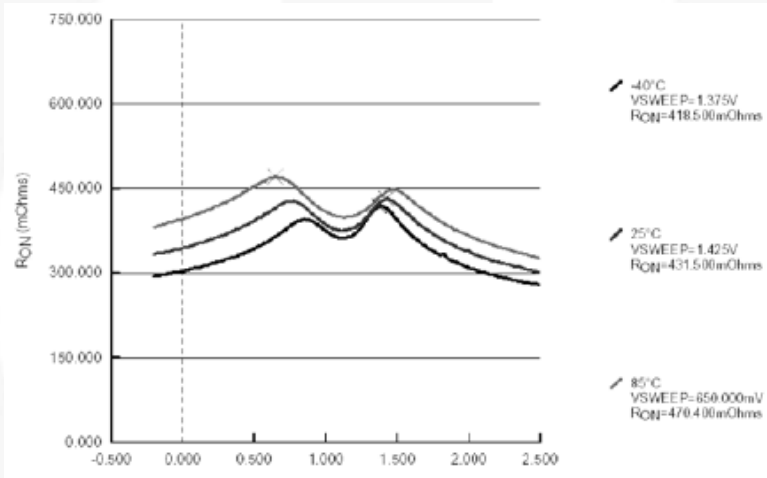


Figure 6.  $R_{ON}$  at 2.3V  $V_{CC}$

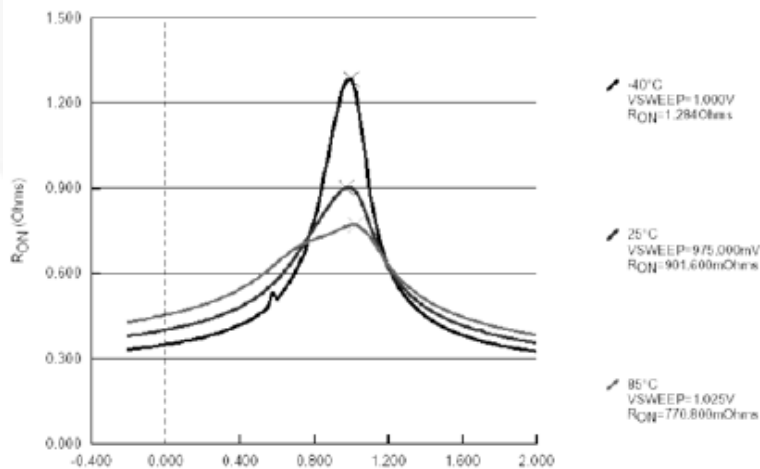


Figure 7.  $R_{ON}$  at 1.8V  $V_{CC}$

### AC Loadings and Waveforms

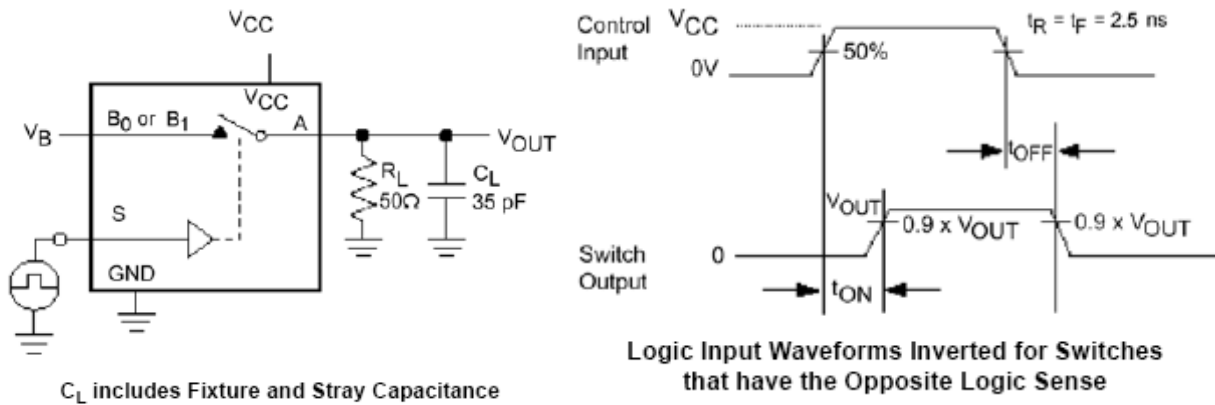


Figure 8. Turn-On / Turn-Off Timing

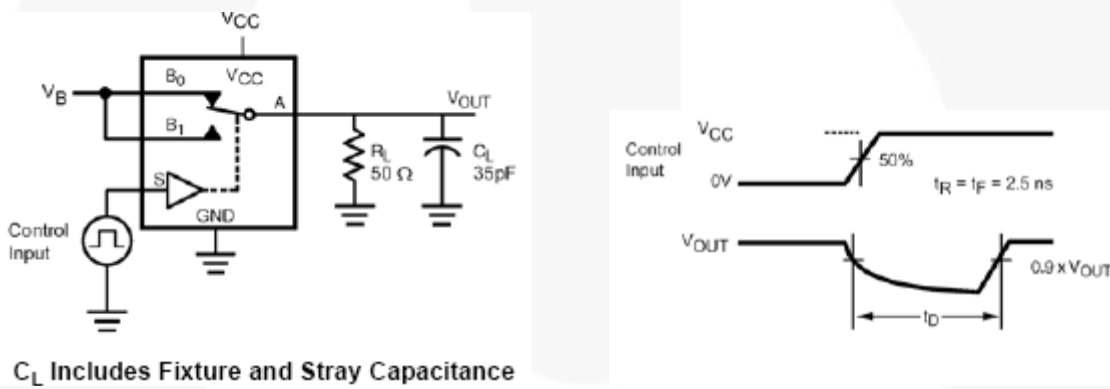


Figure 9. Break-Before-Make Timing

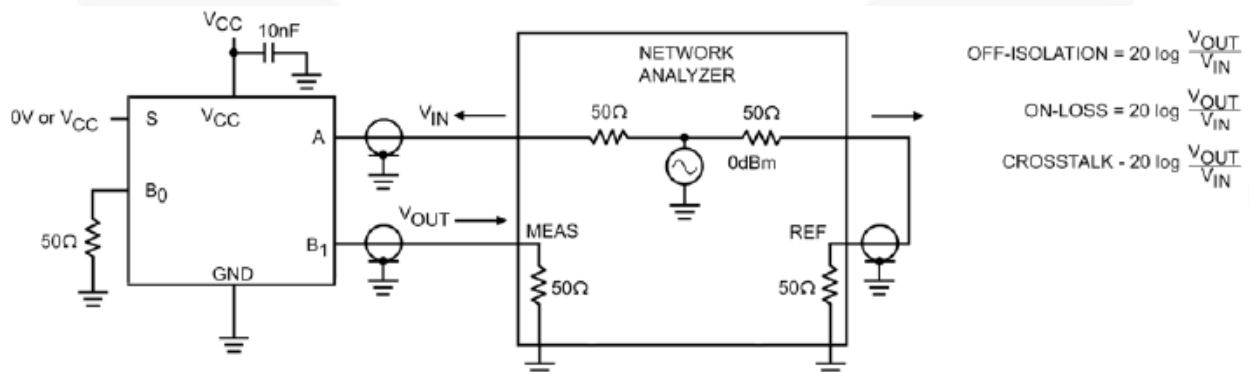
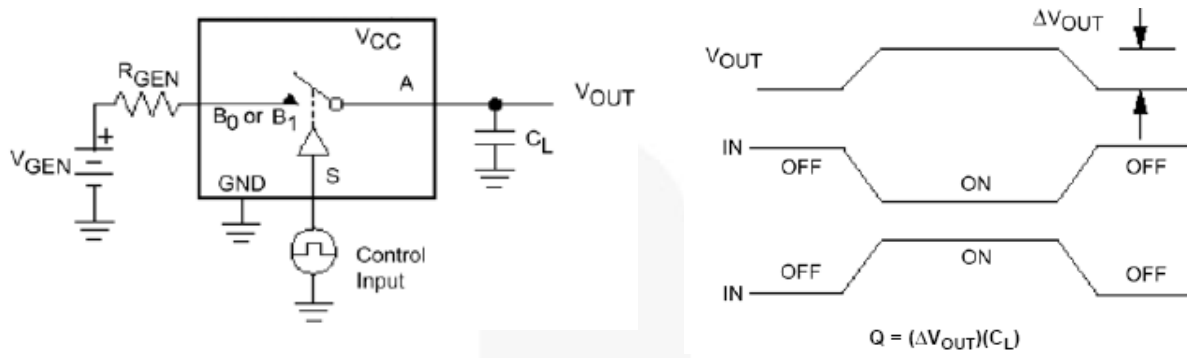


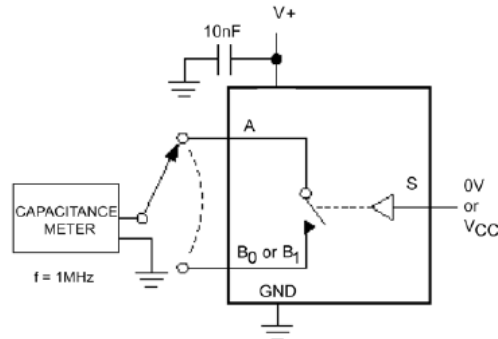
Figure 10. Off Isolation and Crosstalk



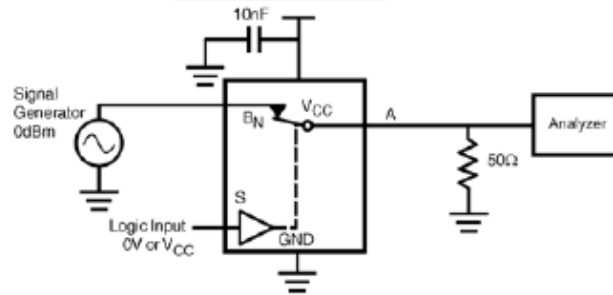
**AC Loadings and Waveforms** (Continued)



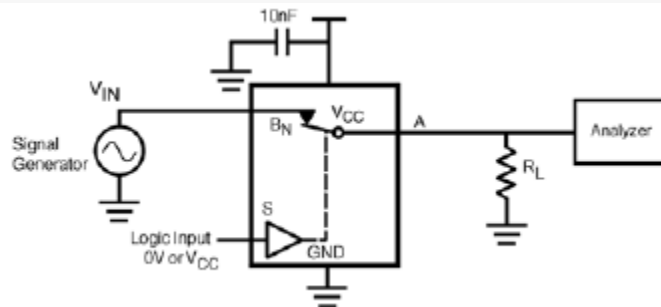
**Figure 11. Charge Injection**



**Figure 12. On / Off Capacitance Measurement Setup**

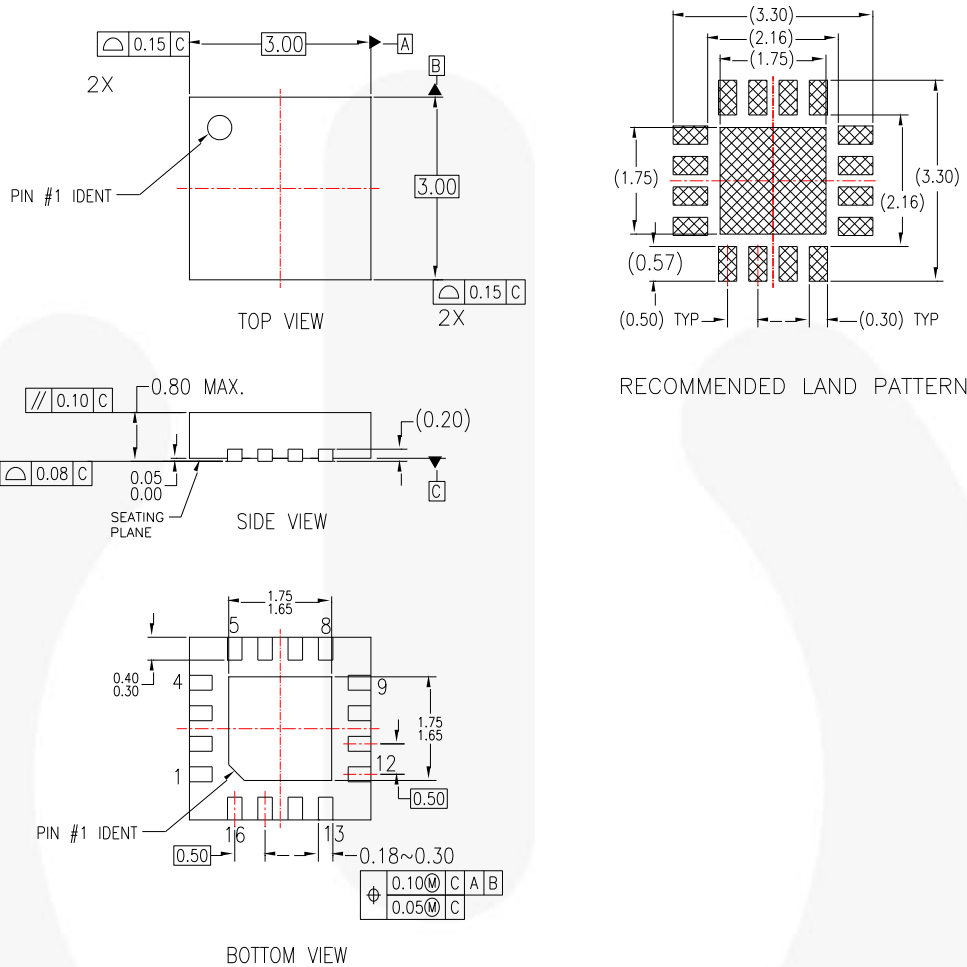


**Figure 13. Bandwidth**



**Figure 14. Harmonic Distortion**

## Package Dimensions



### NOTES:

- A. CONFORMS TO JEDEC REGISTRATION MO-220, VARIATION WEED-Pending, DATED pending
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994
- D. DIMENSIONS ARE EXCLUSIVE OF BURS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

MLP16BrevB

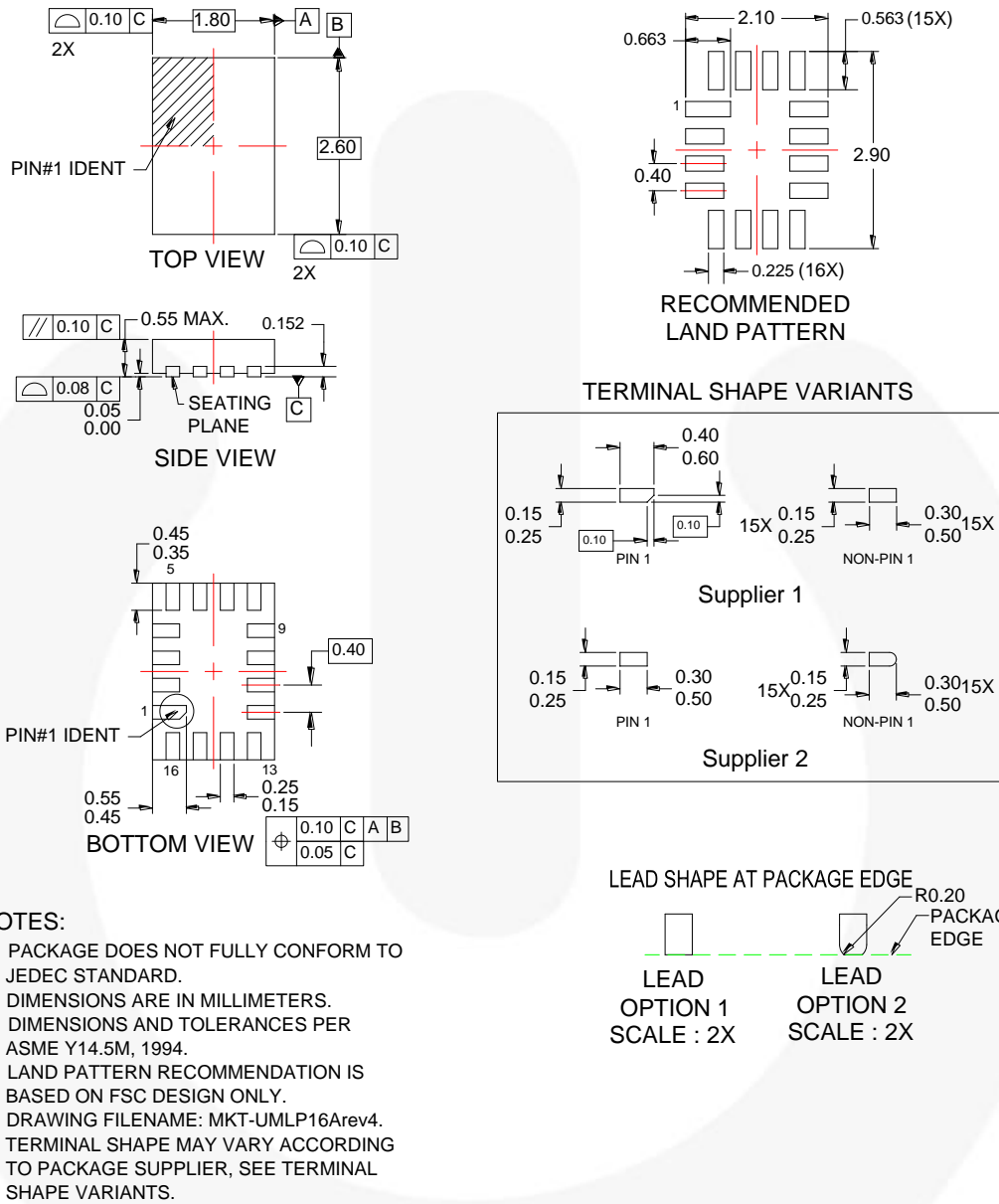
**Figure 15. 16-Lead, Molded Leadless Package (MLP), JEDEC MO-220 3x3mm Square**

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## Package Dimensions



**Figure 16. 16-Lead, Ultrathin Molded Leadless Package (UMLP)**





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