



Is Now Part of



**ON Semiconductor®**

To learn more about ON Semiconductor, please visit our website at  
[www.onsemi.com](http://www.onsemi.com)

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (\_), the underscore (\_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (\_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at [www.onsemi.com](http://www.onsemi.com). Please email any questions regarding the system integration to [Fairchild\\_questions@onsemi.com](mailto:Fairchild_questions@onsemi.com).

ON Semiconductor and the ON Semiconductor logo are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.



# FSA2257

## Low R<sub>ON</sub>, Low-Voltage Dual SPDT Bi-Directional Analog Switch

### Features

- Maximum 1.15 Ω On Resistance (R<sub>ON</sub>) at 4.5 V V<sub>CC</sub>
- 0.3 Ω Maximum R<sub>ON</sub> Flatness at +5 V V<sub>CC</sub>
- Space-Saving MicroPak™
- Broad V<sub>CC</sub> Operating Range: 1.65 V to 5.50 V
- Fast Turn-On and Turn-Off Time
- Break-Before-Make Enable Circuitry
- Over-Voltage Tolerant TTL-Compatible Control Input

### Description

The FSA2257 is a high-performance bi-directional dual Single-Pole/Double-Throw (SPDT) analog switch. This switch can be configured as either a multiplexer or a demultiplexer by select pins. The device features ultra-low R<sub>ON</sub> of 1.3 Ω maximum at 4.5 V V<sub>CC</sub> and operates over the wide V<sub>CC</sub> range of 1.65 V to 5.50 V. The device is fabricated with submicron CMOS technology to achieve fast switching speeds and is designed for break-before-make operation. The select input is TTL-level compatible.

### Applications

- Cell Phone
- PDA
- Mobile Devices

### Ordering Information

Part Number	Package Number	Top Mark	Package Description	Packing Method
FSA2257L10X	MAC10A	EP	10-Lead MicroPak™, 1.6 x 2.1 mm	5000 Units Tape and Reel
FSA2257MTCX	MCT14	FSA2257	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4 mm Wide	2500 Units Tape and Reel
FSA2257MUX	MUA10A	FSA 2257	10-Lead Molded Small Outline Package (MSOP), JEDEC MO-187, 3.0 mm	4000 Units Tape and Reel

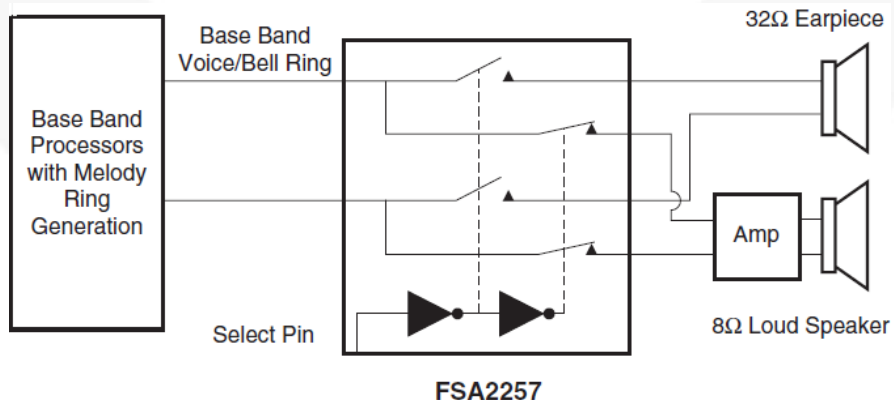


Figure 1. Block Diagram

## Pin Configurations

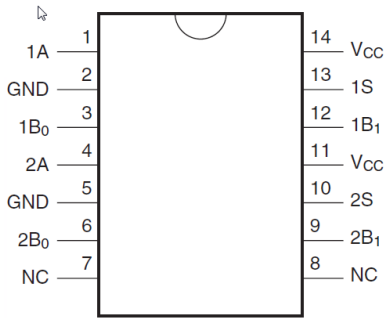


Figure 2. Pin Assignments for TSSOP (Top View)

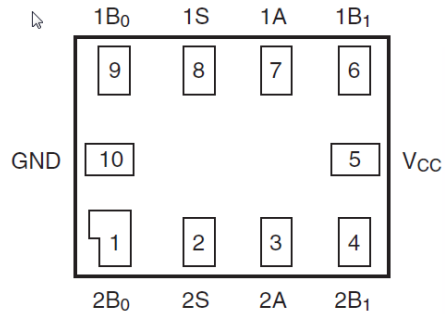


Figure 3. MicroPak™ Pad Assignments (Top View)

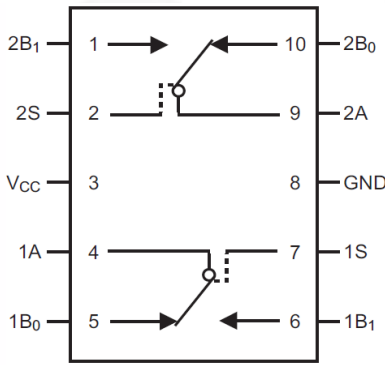


Figure 4. Pin Assignments for MSOP (Top View)

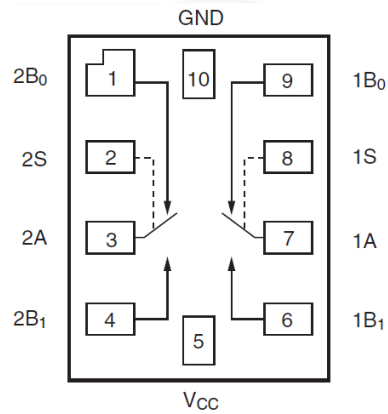


Figure 5. Analog Symbols (Top Through View)

## Pin Definitions

Pin# TSSOP	Pin# MicroPak™	Pin # MSOP	Name	Description
1	7	4	1A	Data Ports
2,5	10	8	GND	Ground
3	9	5	1B <sub>0</sub>	Data Ports
4	3	9	2A	Data Ports
6	1	10	2B <sub>0</sub>	Data Ports
7,8			NC	No Connect
9	4	1	2B <sub>1</sub>	Data Ports
10	2	2	2S	Control Inputs
11,14	5	3	V <sub>CC</sub>	Power Supply
12	6	6	1B <sub>1</sub>	Data Ports
13	8	7	1S	Control Inputs

## Truth Table

Control Input (S)	Function
Low Logic Level	B <sub>0</sub> connected to A
High Logic Level	B <sub>1</sub> connected to A

## 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	6.0	V
V <sub>SW</sub>	DC Switch Voltage <sup>(1)</sup>	-0.5	V <sub>CC</sub> + 0.5	V
V <sub>IN</sub>	DC Input Voltage <sup>(1)</sup>	-0.5	6.0	V
I <sub>IK</sub>	Input Diode Current	-50		mA
	Switch Current		200	
	Peak Switch Current (Pulsed at 1 ms duration, <10% duty cycle)		400	
T <sub>STG</sub>	Storage Temperature Range	-65	+150	°C
T <sub>J</sub>	Maximum Junction Temperature		+150	°C
T <sub>L</sub>	Lead Temperature (Soldering, 10 seconds)		+260	°C
ESD	Electrostatic Discharge Capability	Human Body Model, JESD22-A114	8000	V
		Charged Device Model, JESD22-C101	2000	

**Note:**

1. Input and output negative ratings may be exceeded if 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>	Supply Voltage	1.65	5.50	V
V <sub>CNTRL</sub>	Control Input Voltage <sup>(2)</sup>	0	V <sub>CC</sub>	V
V <sub>SW</sub>	Switch Input Voltage	0	V <sub>CC</sub>	V
T <sub>A</sub>	Operating Temperature	-40	+85	°C

**Note:**

2. Unused control input must be held HIGH or LOW and it must not float.

## DC Electrical Characteristics

Typical values are at 25°C unless otherwise specified.

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	T <sub>A</sub> =+25°C			T <sub>A</sub> =-40°C to +85°C		Unit
				Min.	Typ.	Max.	Min.	Max.	
V <sub>IH</sub>	Input Voltage High		1.8 to 2.7				1.0		V
			2.7 to 3.6				2.0		
			4.5 to 5.5				2.4		
V <sub>IL</sub>	Input Voltage Low		1.8 to 2.7					0.4	V
			2.7 to 3.6					0.6	
			4.5 to 5.5					0.8	
I <sub>IN</sub>	Control Input Leakage	V <sub>IN</sub> =0 V to V <sub>CC</sub>	2.7 to 3.6				-1.0	1.0	μA
			4.5 to 5.5				-1.0	1.0	
I <sub>NO(OFF)</sub> , I <sub>NC(OFF)</sub>	Off Leakage Current of Port B <sub>0</sub> and B <sub>1</sub>	A=1 V, 4.5 V, B <sub>0</sub> or B <sub>1</sub> =1 V, 4.5 V	5.5	-2		2	-20	20	nA
I <sub>A(ON)</sub>	On Leakage Current of Port A	A=1 V, 4.5V, B <sub>0</sub> or B <sub>1</sub> =1 V, 4.5 V or Floating	5.5	-4		2	-40	40	nA
R <sub>ON</sub>	Switch On Resistance MicroPak <sup>(3)</sup>	I <sub>OUT</sub> =100 mA, B <sub>0</sub> or B <sub>1</sub> =1.5 V	1.8		4.6				Ω
			2.7		2.6	4.0		4.3	
	Switch On Resistance MSOP/TSSOP <sup>(3)</sup>	I <sub>OUT</sub> =100 mA, B <sub>0</sub> or B <sub>1</sub> =3.5 V	4.5		0.95	1.15		1.30	
			2.7		2.8			4.5	
ΔR <sub>ON</sub>	On Resistance Matching Between Channels MicroPak <sup>(4)</sup>	I <sub>OUT</sub> =100 mA, B <sub>0</sub> or B <sub>1</sub> =3.5 V	4.5		0.06	0.12		0.15	Ω
			4.5		0.7			0.3	
R <sub>FLAT(ON)</sub>	On Resistance Flatness <sup>(5)</sup>	I <sub>OUT</sub> =100 mA, B <sub>0</sub> or B <sub>1</sub> =0 V, 0.75 V, 1.5 V	1.8		3.0				Ω
			2.7		1.4				
		I <sub>OUT</sub> =100 mA, B <sub>0</sub> or B <sub>1</sub> =0 V, 1 V, 2 V	4.5		0.2	0.3		0.4	
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> =0 V or V <sub>CC</sub> , I <sub>OUT</sub> =0 V	3.6		0.1	0.5		1.0	μA
			5.5		0.1	0.5		1.0	

### Notes:

- On resistance is determined by the voltage drop between A and B pins at the indicated current through the switch.
- ΔR<sub>ON</sub> = R<sub>ONmax</sub> – R<sub>ONmin</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

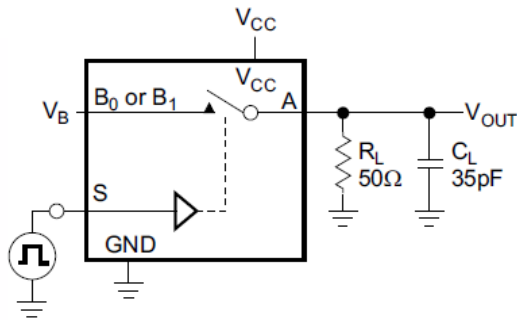
Typical values are at 25°C unless otherwise specified.

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	T <sub>A</sub> =+25°C			T <sub>A</sub> =-40°C to +85°C		Unit	Figure
				Min.	Typ.	Max.	Min.	Max.		
t <sub>ON</sub>	Turn-On Time	B <sub>0</sub> or B <sub>1</sub> =1.5 V, R <sub>L</sub> =50 Ω, C <sub>L</sub> =35 pF	1.8 to 2.7		75				ns	Figure 6
			2.7 to 3.6			50		60		
		B <sub>0</sub> or B <sub>1</sub> =3.0 V, R <sub>L</sub> =50 Ω, C <sub>L</sub> =35 pF	4.5 to 5.5			35		40		
t <sub>OFF</sub>	Turn-Off Time	B <sub>0</sub> or B <sub>1</sub> =1.5 V, R <sub>L</sub> =50 Ω, C <sub>L</sub> =35 pF	1.8 to 2.7		20			ns	Figure 6	
			2.7 to 3.6			20				30
		B <sub>0</sub> or B <sub>1</sub> =3.0 V, R <sub>L</sub> =50 Ω, C <sub>L</sub> =35 pF	4.5 to 5.5			15				20
t <sub>BBM</sub>	Break-Before-Make Time	B <sub>0</sub> or B <sub>1</sub> =1.5 V, R <sub>L</sub> =50 Ω, C <sub>L</sub> =35 pF	2.7 to 3.6				1	ns	Figure 7	
			4.5 to 5.5		20		1			
Q	Charge Injection	C <sub>L</sub> =1.0 nF, V <sub>GEN</sub> =0 V, R <sub>GEN</sub> =0 Ω	2.7 to 3.6		20			pC	Figure 9	
			4.5 to 5.5		10					
OIRR	Off Isolation	f=1 MHz, R <sub>L</sub> =50 Ω	2.7 to 3.6		-70			dB	Figure 8	
			4.5 to 5.5		-70					
Xtalk	Crosstalk	f=1 MHz, R <sub>L</sub> =50 Ω	2.7 to 3.6		-75			dB	Figure 8	
			4.5 to 5.5		-75					
BW	-3 db Bandwidth	R <sub>L</sub> =50 Ω	2.7 to 3.6		200			MHz	Figure 11	
			4.5 to 5.5		200					
THD	Total Harmonic Distortion	R <sub>L</sub> =600 Ω, V <sub>IN</sub> =0.5 V <sub>PP</sub> f=20 Hz to 20 kHz	2.7 to 3.6		0.002			%	Figure 12	
			4.5 to 5.5		0.002					

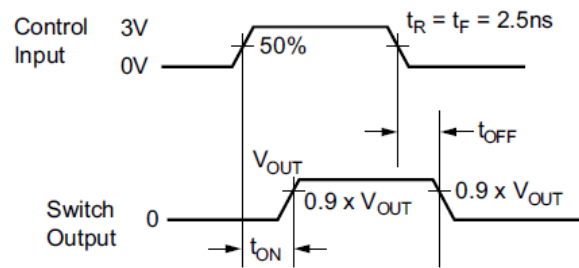
## Capacitance

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	T <sub>A</sub> =+25°C			Unit	Figure
				Min.	Typ.	Max.		
C <sub>IN</sub>	Control Pin Input Capacitance	f=1 MHz	0		3.5		pF	Figure 10
C <sub>OFF</sub>	B Port Off Capacitance	f=1 MHz	4.5		12.0		pF	Figure 10
C <sub>ON</sub>	A Port On Capacitance	f=1 MHz	4.5		40.0		pF	Figure 10

## AC Loadings and Waveforms

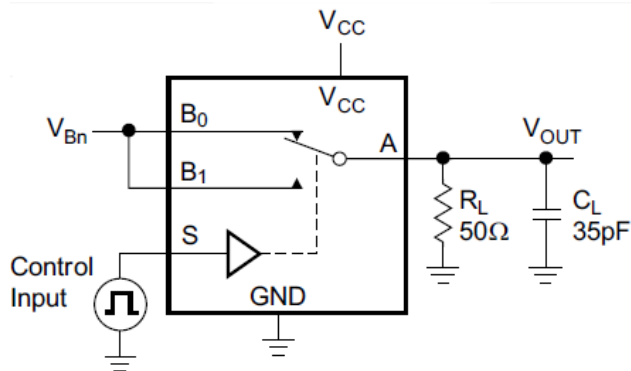


$C_L$  Includes Fixture and Stray Capacitance



Logic Input Waveforms Inverted for Switches that have the Opposite Logic Sense

Figure 6. Turn On / Off Timing



$C_L$  Includes Fixture and Stray Capacitance

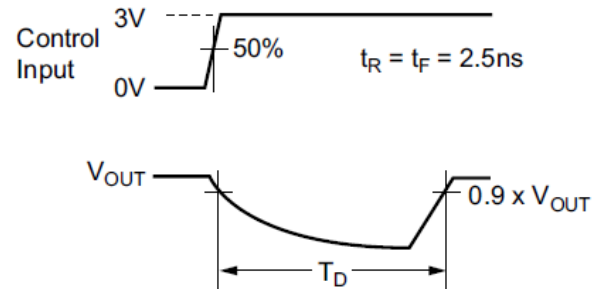
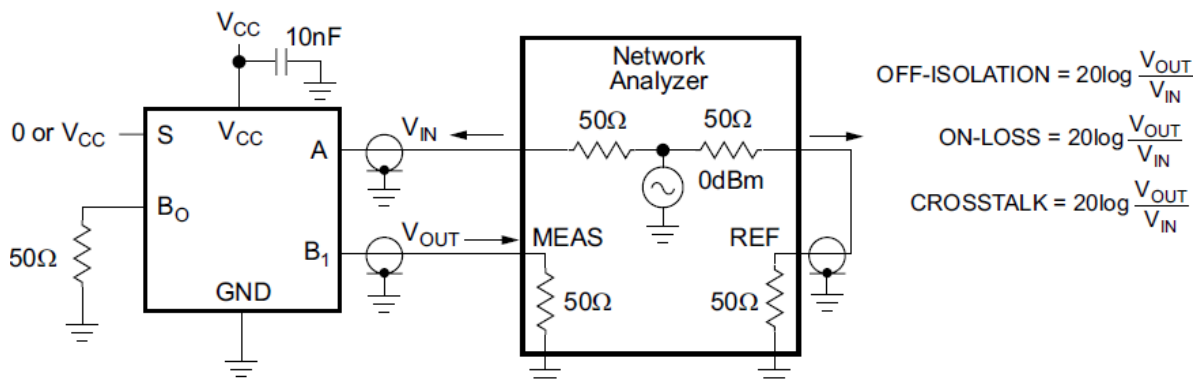


Figure 7. Break Before Make Timing



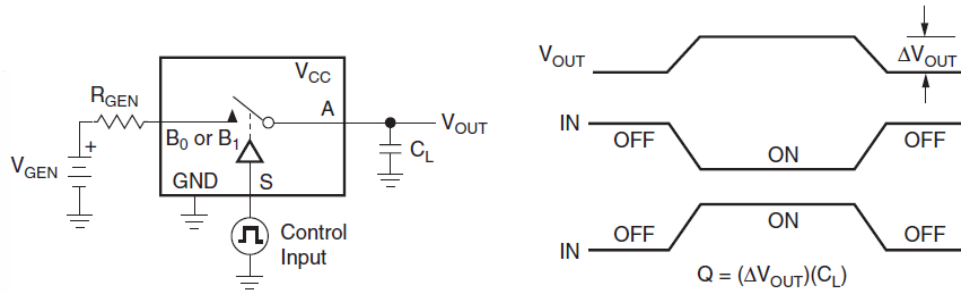
$$\text{OFF-ISOLATION} = 20 \log \frac{V_{\text{OUT}}}{V_{\text{IN}}}$$

$$\text{ON-LOSS} = 20 \log \frac{V_{\text{OUT}}}{V_{\text{IN}}}$$

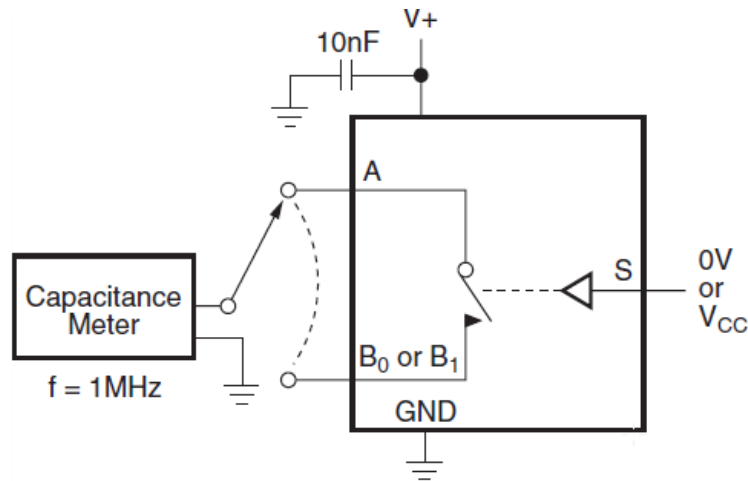
$$\text{CROSSTALK} = 20 \log \frac{V_{\text{OUT}}}{V_{\text{IN}}}$$

Figure 8. Off Isolation and Crosstalk

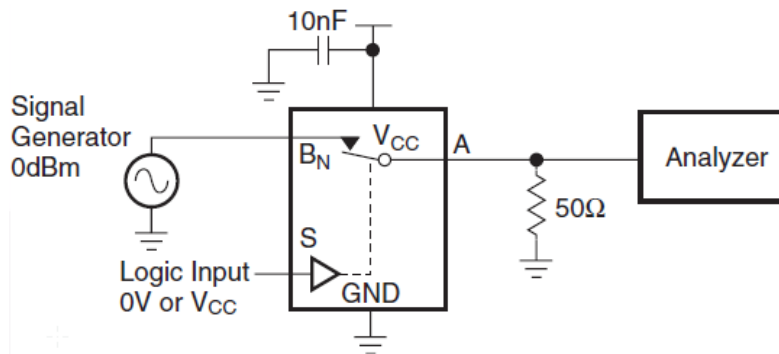
**AC Loadings and Waveforms (Continued)**



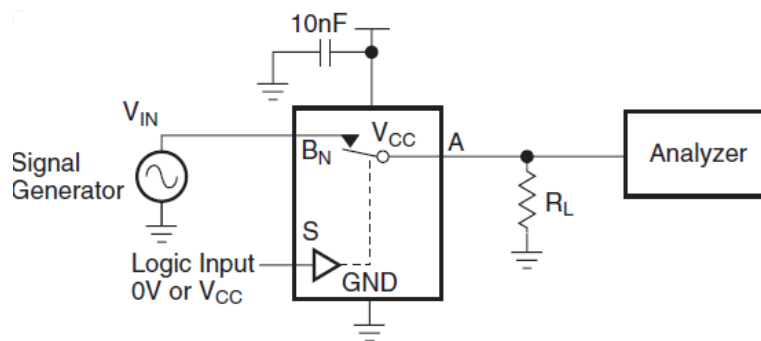
**Figure 9. Charge Injection**



**Figure 10. On / Off Capacitance Measurement Setup**

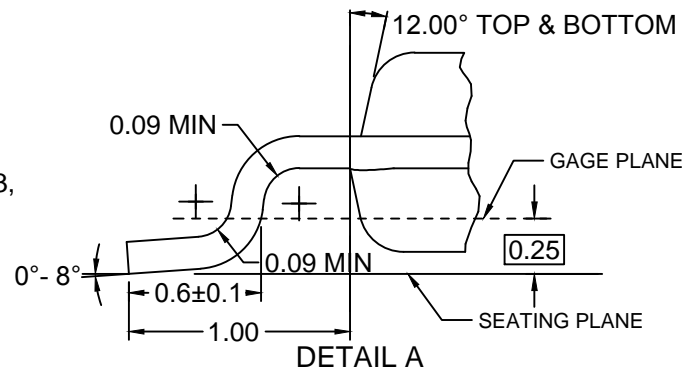
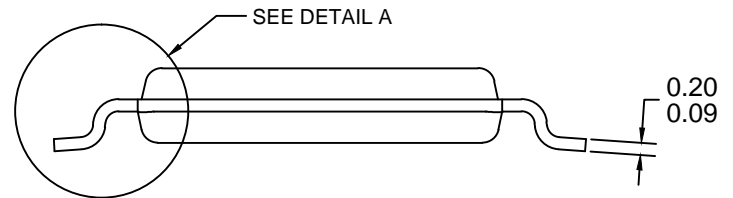
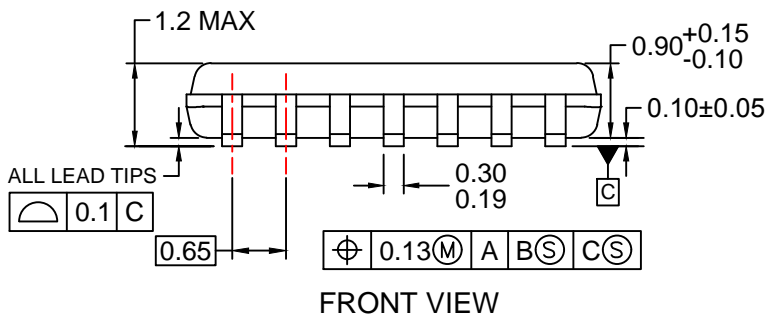
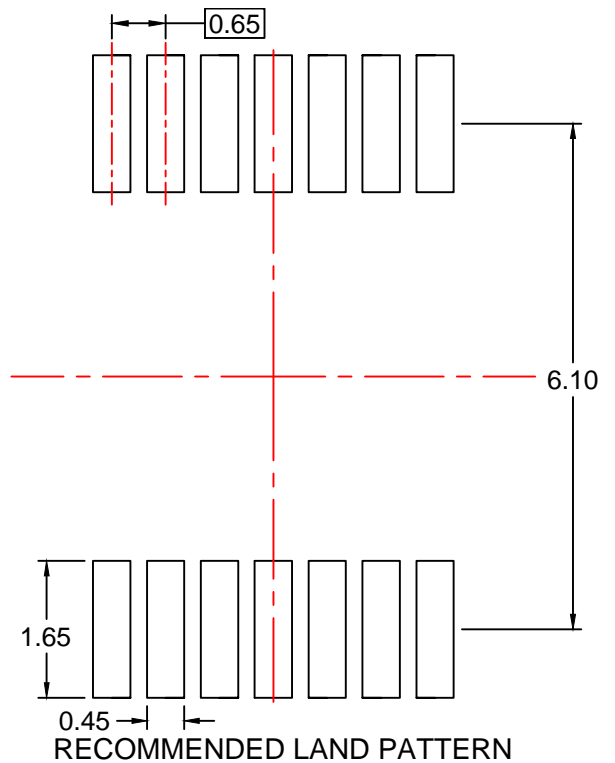
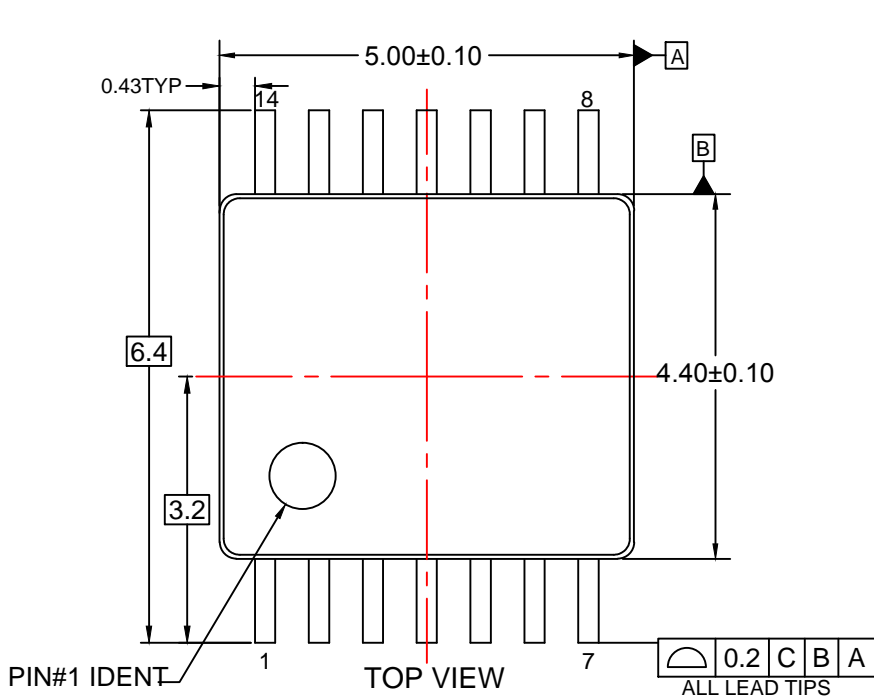


**Figure 11. Bandwidth**



**Figure 12. Harmonic Distortion**





**NOTES:**

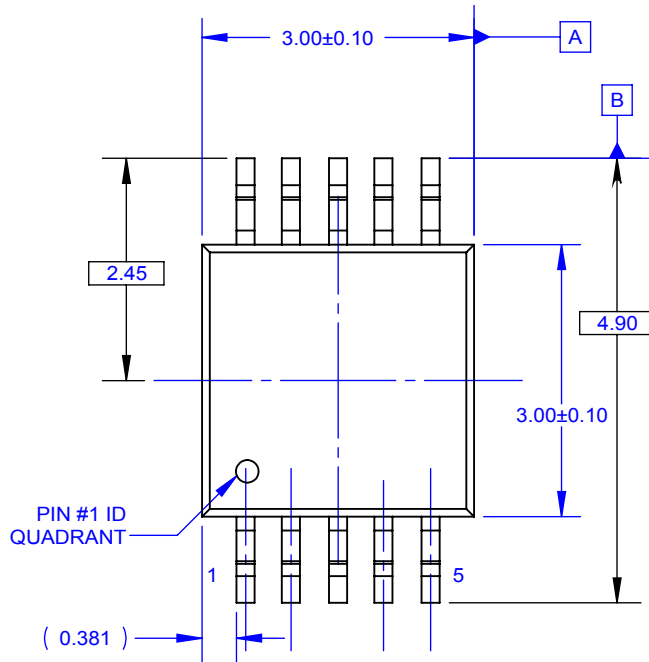
- A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AB, REF NOTE 6
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS
- D. DIMENSIONING AND TOLERANCES PER ANSI Y14.5M, 2009.
- E. LANDPATTERN STANDARD: SOP65P640X110-14M.
- F. DRAWING FILE NAME: MKT-MTC14rev7.



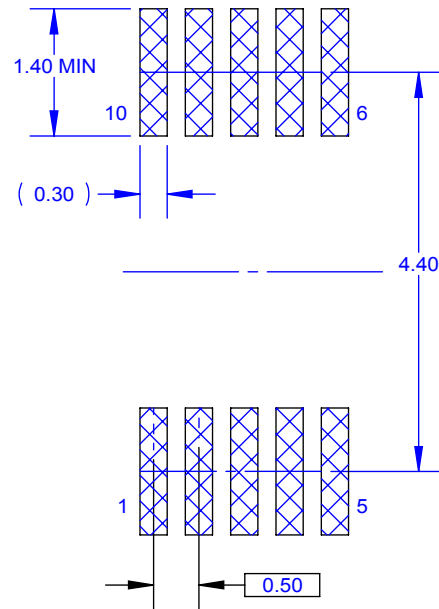
THIS DRAWING IS THE PROPERTY OF FAIRCHILD SEMICONDUCTOR CORPORATION. NO USE THEREOF SHALL BE MADE OTHER THAN AS A REFERENCE FOR PROPOSALS AS SUBMITTED TO FAIRCHILD SEMICONDUCTOR CORPORATION FOR JOBS TO BE EXECUTED IN CONFORMITY WITH SUCH PROPOSALS UNLESS THE CONSENT OF SAID FAIRCHILD SEMICONDUCTOR CORPORATION HAS PREVIOUSLY BEEN OBTAINED. NO PART OF THIS DRAWING SHALL BE COPIED OR DUPLICATED OR ITS CONTENTS DISCLOSED. THE INFORMATION CONTAINED ON THIS DRAWING IS CONFIDENTIAL AND PROPRIETARY.

### REVISIONS

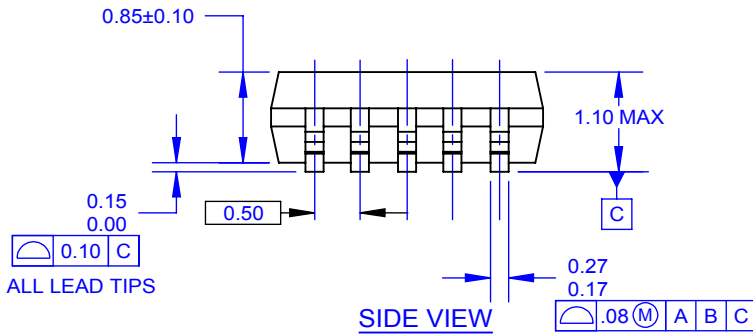
NBR	DESCRIPTION	DATE	BY/APP'D
B	REDREW FORMER NSC DWG	07JUN2006	H.ALLEN
2	* REMOVE SITE ADDRESS AND CHANGE REVISION TO NUMERICAL & CHANGED LAND PATTERN TO IPC. * CHANGE LEAD WIDTH FROM 0.27MAX TO 0.33MAX. * REMOVE DATE OF JEDEC REVISION	20AUG2009	KHLEE/FSSZ
3	* REVERT LEAD WIDTH TO 0.27MAX.	24SEP2009	KHLEE/FSSZ



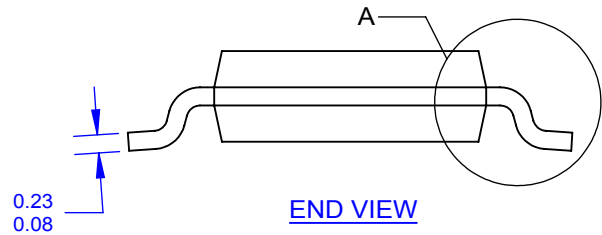
TOP VIEW



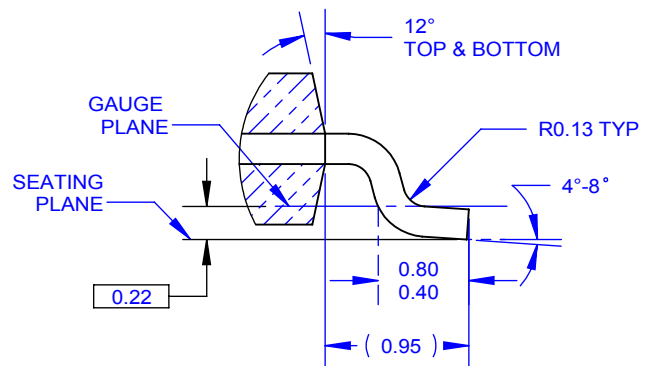
LAND PATTERN RECOMMENDATION



SIDE VIEW



END VIEW

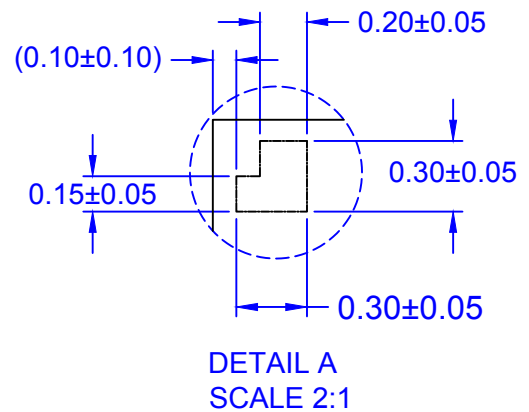
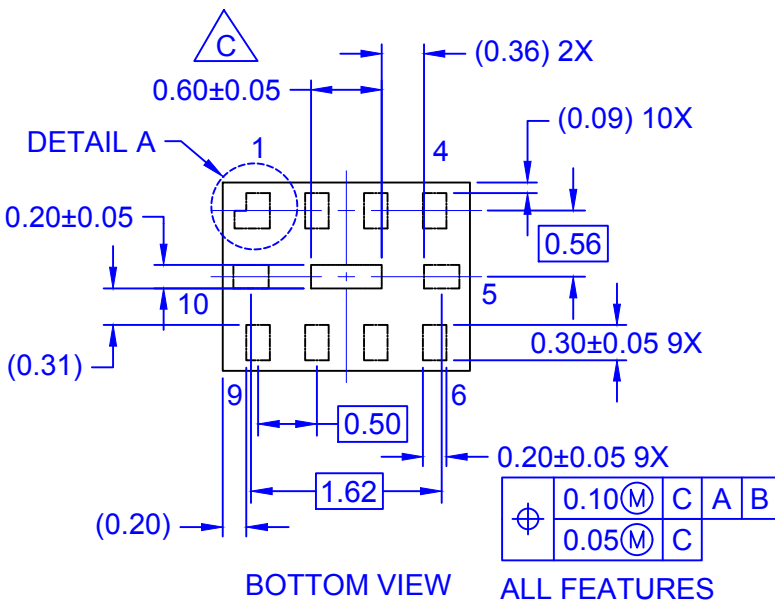
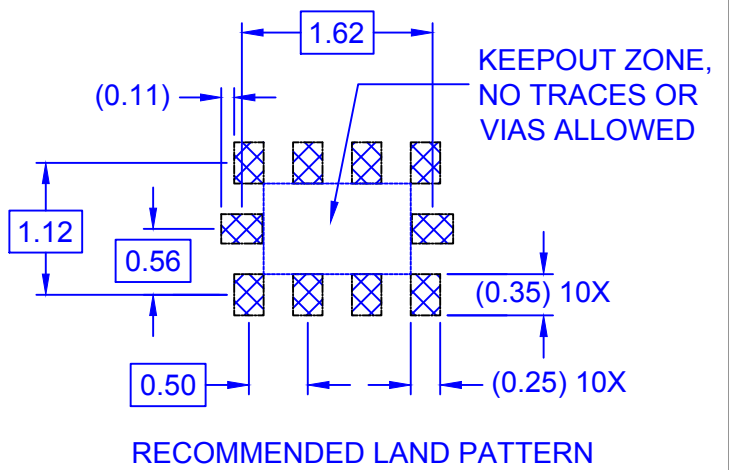
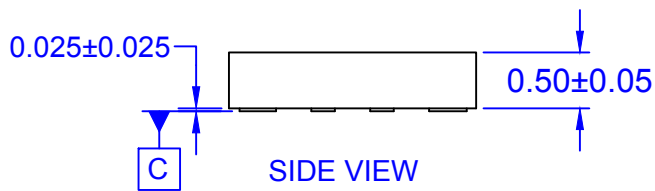
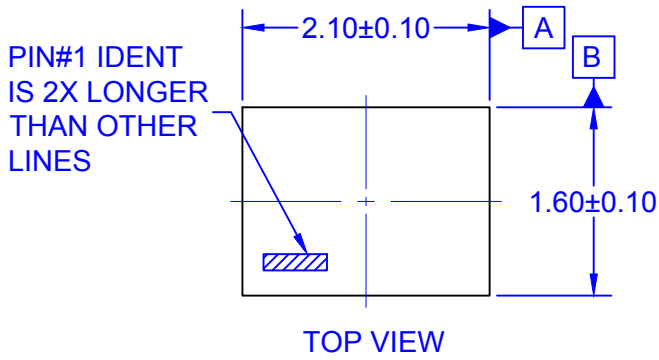


DETAIL A  
SCALE 20 : 1

NOTES: UNLESS OTHERWISE SPECIFIED

- A. THIS PACKAGE CONFORMS TO JEDEC MO-187 VARIATION BA.
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES AS PER ASME Y14.5-1994.
- E. LAND PATTERN AS PER IPC7351#SOP50P490X110-10AN
- F. FILE NAME: MKT-MUA10AREV3

APPROVALS		DATE	FAIRCHILD SEMICONDUCTOR™		
DRAWN: BOBOY MALDO		24SEP09	10LD, MSOP, JEDEC MO-187, 3.0MM WIDE		
CHECKED: KH LEE					
APPROVED: BY HUANG					
APPROVED: HOWARD ALLEN					
PROJECTION			SCALE 1:1	SIZE N/A	DRAWING NUMBER MKT-MUA10A
FORMERLY: N/A			SHEET: 1 OF 1		REV 3



NOTES:

- A. PACKAGE CONFORMS TO JEDEC REGISTRATION MO-255, VARIATION UABD.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. PRESENCE OF CENTER PAD IS PACKAGE SUPPLIER DEPENDENT. IF PRESENT IT IS NOT INTENDED TO BE SOLDERED AND HAS A BLACK OXIDE FINISH.
- D. DRAWING FILENAME: MKT-MAC10ArevG.
- E. DIMENSIONS WITHIN ( ) ARE UNCONTROLLED.

ON Semiconductor



ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor  
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA  
**Phone:** 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
**Fax:** 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
**Email:** [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

**N. American Technical Support:** 800-282-9855 Toll Free  
USA/Canada  
**Europe, Middle East and Africa Technical Support:**  
Phone: 421 33 790 2910  
**Japan Customer Focus Center**  
Phone: 81-3-5817-1050

**ON Semiconductor Website:** [www.onsemi.com](http://www.onsemi.com)  
**Order Literature:** <http://www.onsemi.com/orderlit>  
For additional information, please contact your local  
Sales Representative