



Is Now Part of



ON Semiconductor®

To learn more about ON Semiconductor, please visit our website at
www.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. 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.



FSA4157, FSA4157A

Low-Voltage, 1 Ω SPDT Analog Switch

Features

- FSA4157A Features Lower I_{CC} when the S Input is Lower Than V_{CC}
- Maximum 1.15 Ω On Resistance (R_{ON}) at 4.5 V V_{CC}
- 0.3 Ω Maximum R_{ON} Flatness at 4.5 V V_{CC}
- Space-Saving 6-lead, MicroPak™ and SC70 6 Packages
- Broad V_{CC} Operating Range:
 - FSA4157: 1.65 V to 5.5 V
 - FSA4157A: 2.7 V to 5.5 V
- Fast Turn-On and Turn-Off Time
- Break-Before-Make Enable Circuitry
- Over-Voltage Tolerant TTL-Compatible Control Circuitry

Description

FSA4157 and FSA4157A are high performance Single Pole/Double Throw (SPDT) analog switches. Both devices feature ultra low R_{ON} of 1.15 Ω maximum at 4.5 V V_{CC} and operates over the wide V_{CC} range of 1.65 V to 5.5 V for FSA4157, and 2.7 V to 5.5 V for FSA4157A. The device is fabricated with sub-micron CMOS technology to achieve fast switching speeds and is designed for break-before-make operation. The select input is TTL level compatible.

The FSA4157A features very low quiescent current even when the control voltage is lower than the V_{CC} supply. This feature services the mobile handset applications very well allowing for the direct interface with baseband processor general purpose I/Os.

Ordering Information

Part Number	Top Mark	Package Description	Packing Method
FSA4157P6X	A57	6-Lead SC70, EIAJ SC88, 1.25 mm Wide	3000 Units Tape and Reel
FSA4157L6X	EG	6-Lead MicroPak,™ 1.0 mm Wide	5000 Units Tape and Reel
FSA4157AP6X	B57	6-Lead SC70, EIAJ SC88, 1.25 mm Wide	3000 Units Tape and Reel
FSA4157AL6X	EU	6-Lead MicroPak™, 1.0 mm Wide	5000 Units Tape and Reel

Pin Configurations

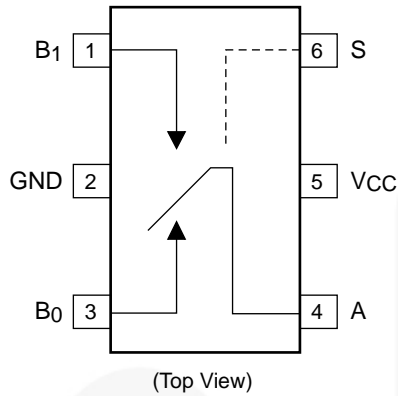


Figure 1. SC70 Pin Assignments

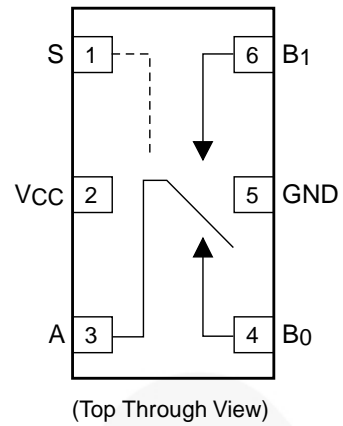


Figure 2. MicroPak™ Pin Assignments

Pin Definitions

Pin# SC70	Pin# MicroPak™	Name	Description
1	6	B1	Data Ports
2	5	GND	Ground
3	4	B0	Data Ports
4	3	A	Data Ports
5	2	V _{CC}	Supply Voltage
6	1	S	Control Input

Truth Table

Control Input (S)	Function
Low	B0 connected to A
High	B1 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_{CC}	Supply Voltage		-0.5	6.0	V
V_S	DC Switch Voltage ⁽¹⁾		-0.5	$V_{CC} + 0.5$	V
V_{IN}	DC Input Voltage ⁽¹⁾		-0.5	6.0	V
I_{IK}	DC Input Diode Current		-50		mA
I_{SW}	Switch Current			200	mA
I_{SWPEAK}	Peak Switch Current (Pulse at 1 ms duration, <10% Duty Cycle)			400	mA
P_D	Power Dissipation at 85°C	SC70		180	mW
		MicroPak™			
T_{STG}	Storage Temperature Range		-65	+150	°C
T_J	Maximum Junction Temperature			+150	°C
T_L	Lead Temperature (Soldering, 10 seconds)			+260	°C
ESD	Electrostatic Discharge Capability	Human Body Model, JESD22-A114 (FSA4157A)		7500	V

Note:

- 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_{CC}	Supply Voltage	FSA4157	1.65	5.50	V
		FSA4157A	2.7	5.5	
V_{CNTRL}	Control Input Voltage ⁽²⁾		0	V_{CC}	V
V_{SW}	Switch Input Voltage		0	V_{CC}	V
T_A	Operating Temperature		-40	+85	°C
θ_{JA}	Thermal Resistance in Still Air	SC70		350	°C/W
		MicroPak™ (Estimated)		330	

Note:

- 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 _{CC} (V)	Ambient Temperature					Unit
				-25°			-40 to +85°C		
				Min.	Typ.	Max.	Min.	Max.	
V _{IH}	Input Voltage High	FSA4157 Only	1.8 to 2.7				1.0		V
			2.7 to 3.6				2.0		
			4.5 to 5.5				2.4		
V _{IL}	Input Voltage Low	FSA4157 Only	1.8 to 2.7					0.4	V
		FSA4157A Only	2.7 to 3.6					0.4	
			2.7 to 3.6					0.6	
			4.5 to 5.5					0.8	
I _{IN}	Control Input Leakage	V _{IN} =0 V to V _{CC}	2.7 to 3.6				-1.0	1.0	μA
			4.5 to 5.5				-1.0	1.0	
I _{NO(OFF)} , I _{NC(OFF)}	Off Leakage Current of Port B0 and B1	A=1 V, 4.5 V, B ₀ or B ₁ =4.5, 1 V	5.5		±2		-20	20	nA
I _{A(ON)}	On Leakage Current of Port A	A=1 V, 4.5V, B ₀ or B ₁ =4.5, 1 V, 4.5 V or Floating	5.5		±4		-40	40	nA
R _{ON}	Switch On Resistance	I _{OUT} =100 mA, B ₀ or B ₁ =1.5 V	2.7		2.6	4.0		4.3	Ω
		I _{OUT} =100mA, B ₀ or B ₁ =3.5V	4.5		0.95	1.15		1.30	
ΔR _{ON}	On Resistance Matching Between Channels ⁽⁴⁾	I _{OUT} =100 mA, B ₀ or B ₁ =1.5 V	4.5		0.06	0.12		0.15	Ω
R _{FLAT(ON)}	On Resistance Flatness ⁽⁴⁾	I _{OUT} =100 mA, B ₀ or B ₁ =0 V, 0.75 V, 1.5 V	2.7		1.4				Ω
		I _{OUT} =100 mA, B ₀ or B ₁ =0 V, 1 V, 2 V	4.5		0.2	0.3		0.4	
I _{CC}	Quiescent Supply Current	V _{IN} =0 V or V _{CC} , I _{OUT} =0 V	3.6		0.1	0.5		1.0	μA
			5.5		0.1	0.5		1.0	
ΔI _{CC}	Increase in I _{CC} per Input	One Input at 2.7 V, others at V _{CC} or GND (FSA4157A Only)	4.3		0.2			10.0	μA

Notes:

- 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 voltage on the two (A or B ports).
- ΔR_{ON} = R_{ON max} – R_{ON min} measured at identical V_{CC}, 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 _{CC} (V)	Ambient Temperature					Unit	Figure
				-25°			-40 to +85°C			
				Min.	Typ.	Max.	Min.	Max.		
t _{ON}	Turn-On Time	B ₀ or B ₁ =1.5 V, R _L =50 Ω , C _L =35 pF (FSA4157A Only)	2.7 to 3.6			60		65	ns	Figure 8
		B ₀ or B ₁ =1.5 V, R _L =50 Ω , C _L =35pF	2.7 to 3.6			50		60		
		B ₀ or B ₁ =1.5 V, R _L =50 Ω , C _L =35pF	4.5 to 5.5			35		40		
t _{OFF}	Turn-Off Time	B ₀ or B ₁ =1.5 V, R _L =50 Ω , C _L =35 pF	2.7 to 3.6			20		30	ns	Figure 8
		B ₀ or B ₁ =1.5 V, R _L =50 Ω , C _L =35 pF	4.5 to 5.5			15		20		
t _{BBM}	Break-Before-Make Time	FSA4157	2.7 to 3.6						ns	Figure 9
			4.5 to 5.5		20					
		FSA4157A Only	4.5 to 5.5		25					
Q	Charge Injection	C _L =1.0 nF, V _{GE} =0 V, R _{GEN} =0 Ω	2.7 to 3.6		10			pC	Figure 11	
			4.5 to 5.5		20					
OIRR	Off Isolation	f=1 MHz, R _L =50 Ω	2.7 to 3.6		-70			dB	Figure 10	
			4.5 to 5.5		-70					
Xtalk	Crosstalk	f=1 MHz, R _L =50 Ω	2.7 to 3.6		-70			dB	Figure 10	
			4.5 to 5.5		-70					
BW	-3db Bandwidth	R _L =50 Ω	2.7 to 3.6			300		MHz	Figure 13	
			4.5 to 5.5			300				
THD	Total Harmonic Distortion	R _L =600 Ω , V _{IN} =0.5, f=20 Hz to 20 kHz	2.7 to 3.6		0.002			%	Figure 14	
			4.5 to 5.5		0.002					

Capacitance

Symbol	Parameter	Conditions	V _{CC} (V)	Ambient Temperature			Unit	Figure
				-25°				
				Min.	Typ.	Max.		
C _{IN}	Control Pin Input Capacitance	f=1 MHz	0		3.5		pF	Figure 12
C _{OFF}	B Port Off Capacitance	f=1 MHz	4.5		12.0		pF	Figure 12
C _{ON}	On Capacitance	f=1 MHz	4.5		40.0		pF	Figure 12

Typical Performance Characteristics

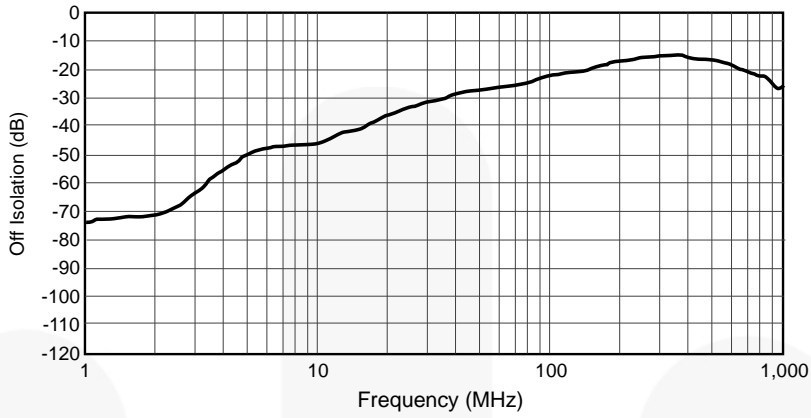


Figure 3. Off Isolation, $V_{CC} = 2.7\text{ V to }5.5\text{ V}$

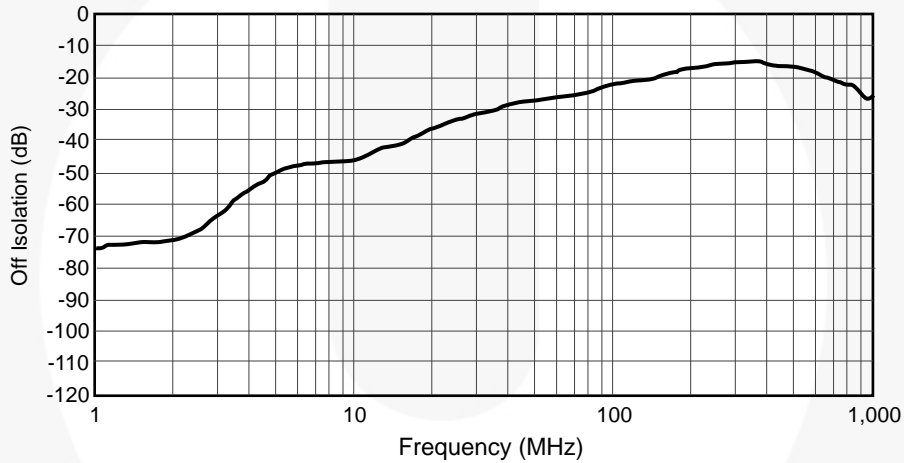


Figure 4. Crosstalk, $V_{CC} = 2.7\text{ V to }5.5\text{ V}$

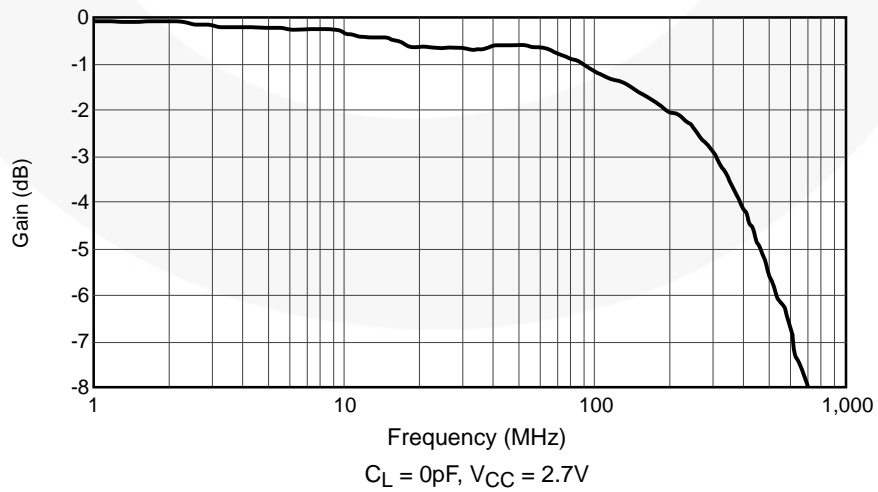


Figure 5. Bandwidth, $V_{CC} = 2.7\text{ V to }5.5\text{ V}$

Typical Performance Characteristics (Continued)

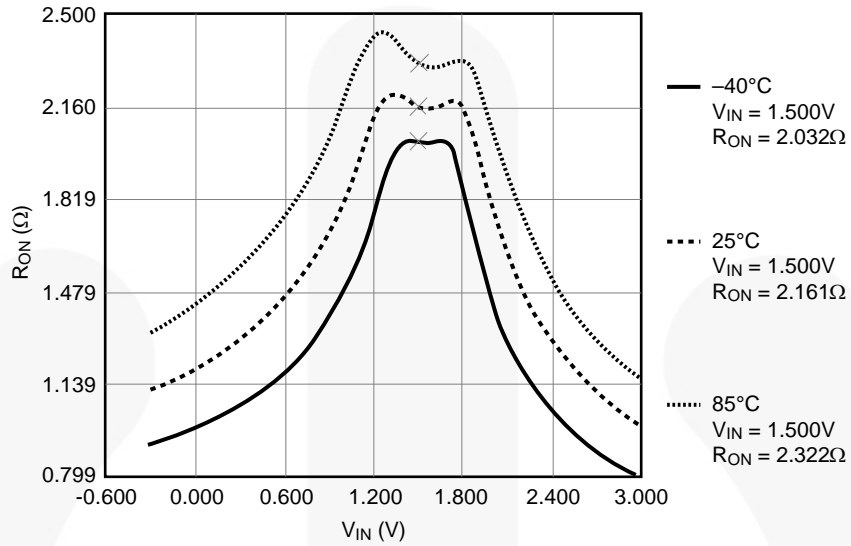


Figure 6. R_{ON} Switch On Resistance, I_{ON} = 100 mA, V_{CC} = 2.7

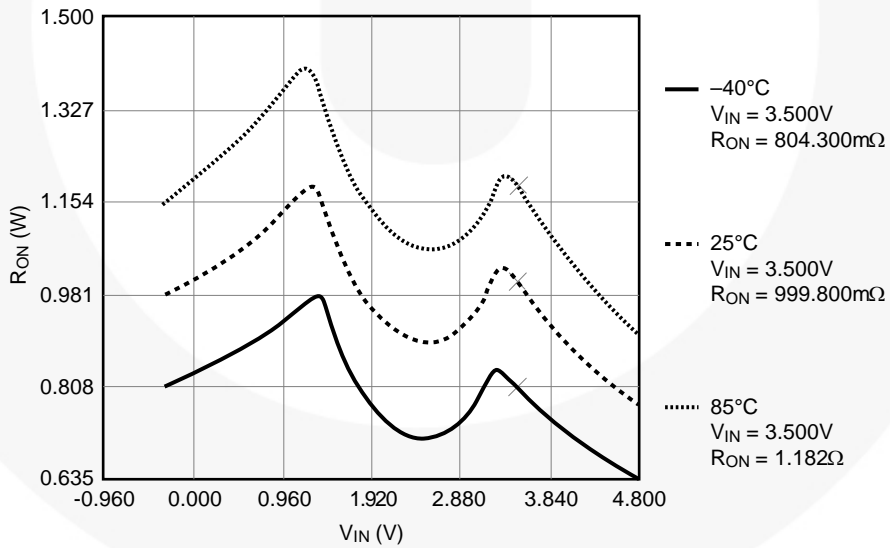


Figure 7. R_{ON} Switch On Resistance, I_{ON} = 100 mA, V_{CC} = 4.5 V

AC Loadings and Waveforms

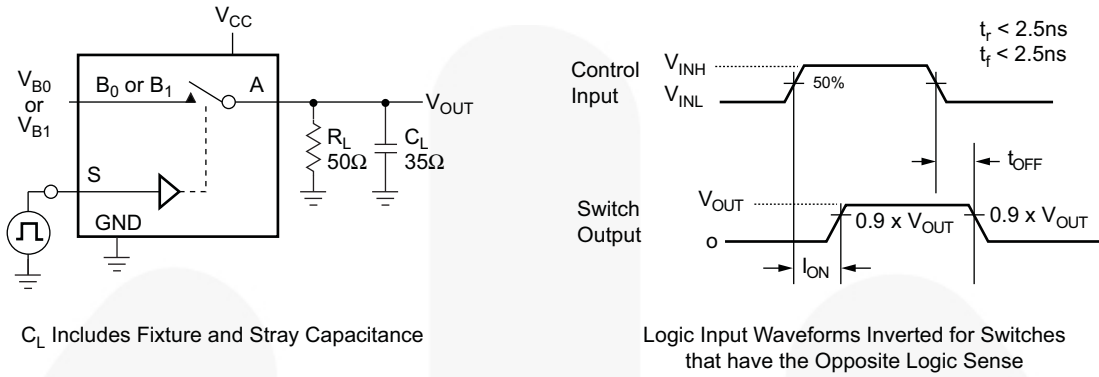


Figure 8. Turn On / Off Timing

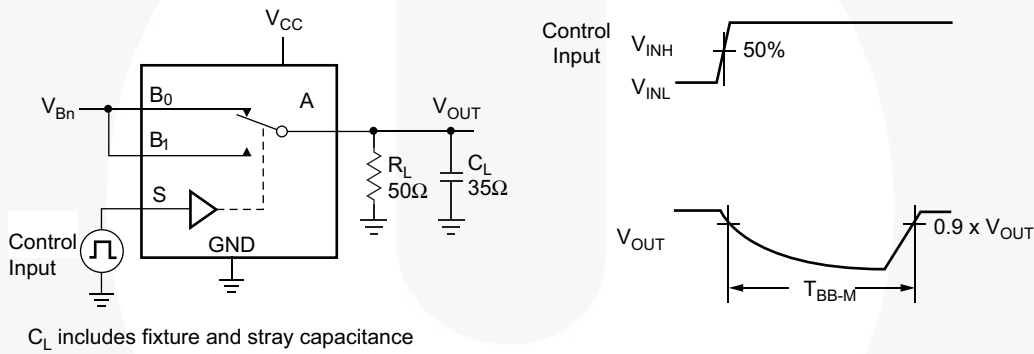


Figure 9. Break Before Make Timing

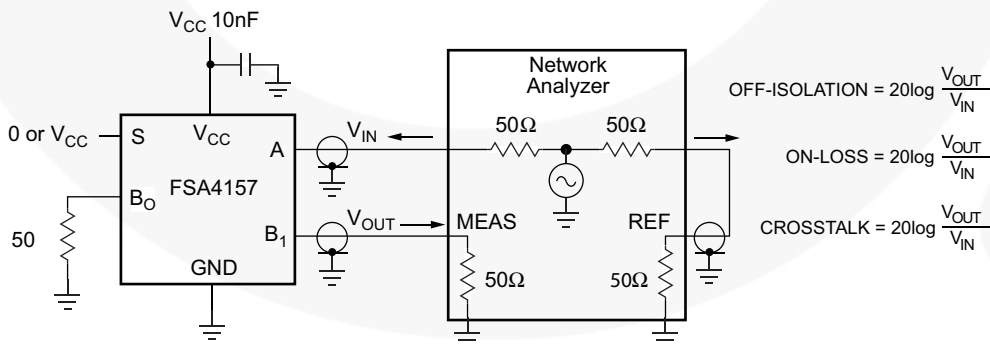


Figure 10. Off Isolation and Crosstalk

AC Loadings and Waveforms (Continued)

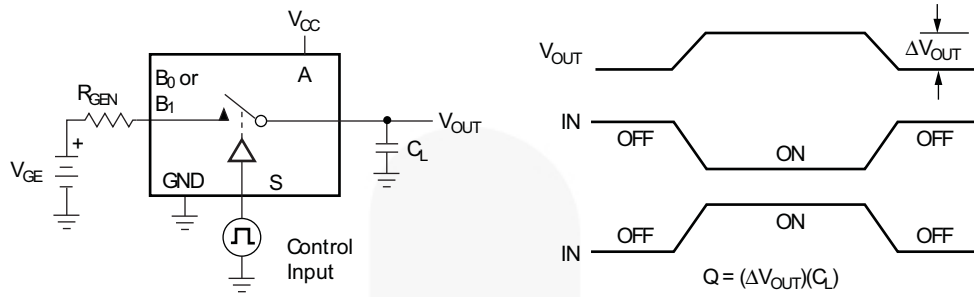


Figure 11. Charge Injection

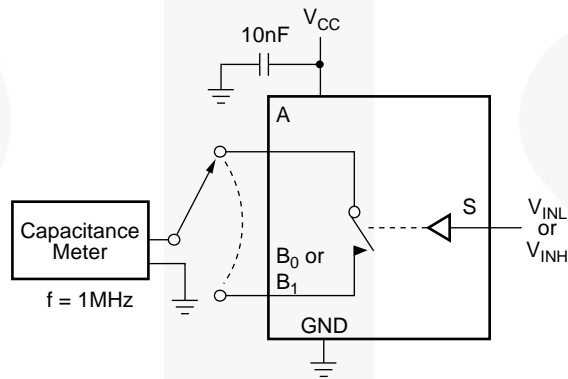


Figure 12. On / Off Capacitance Measurement Setup

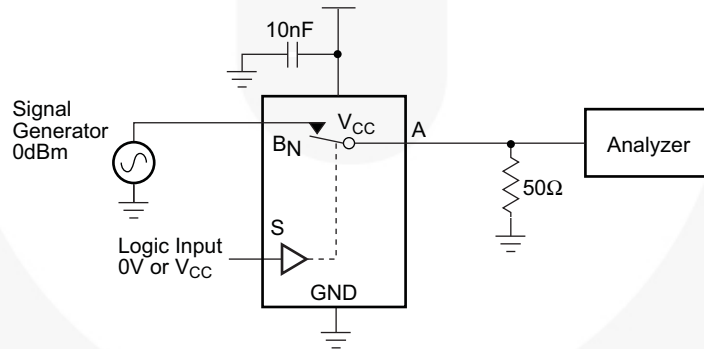


Figure 13. Bandwidth

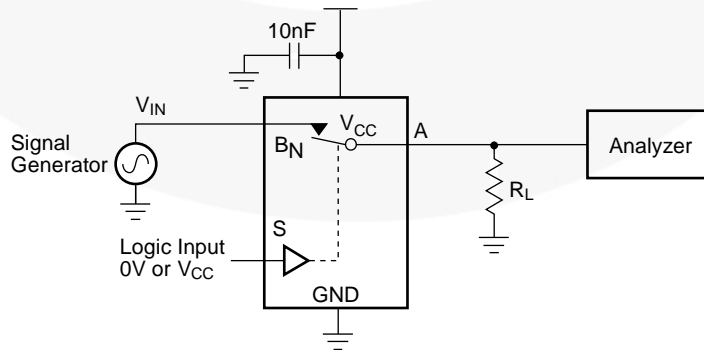
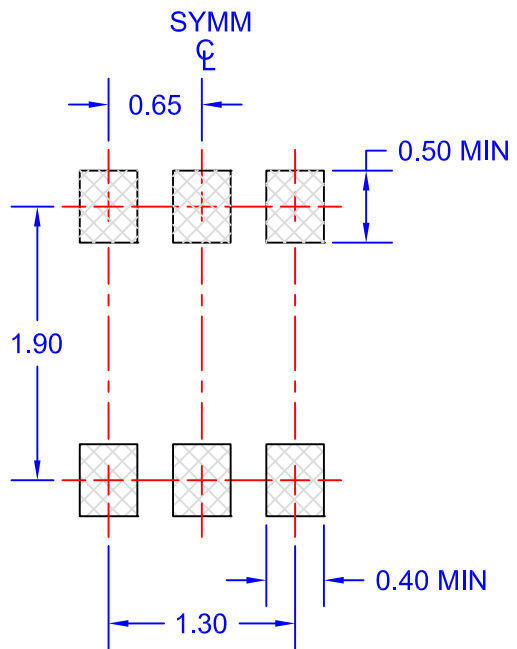
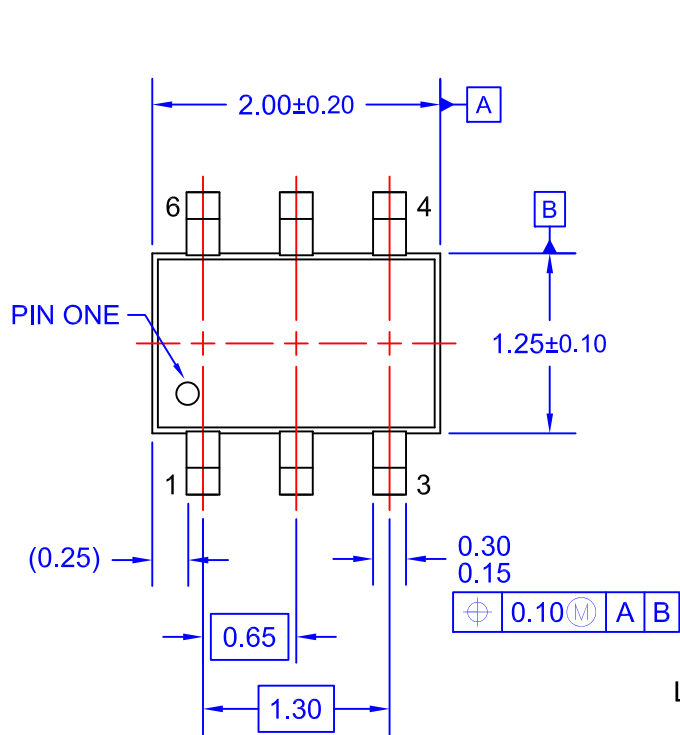
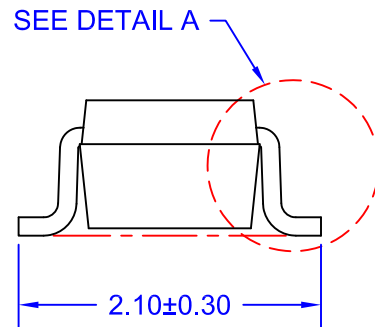
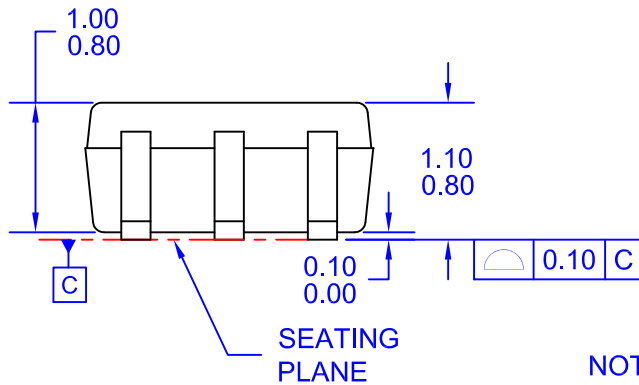


Figure 14. Harmonic Distortion



LAND PATTERN RECOMMENDATION

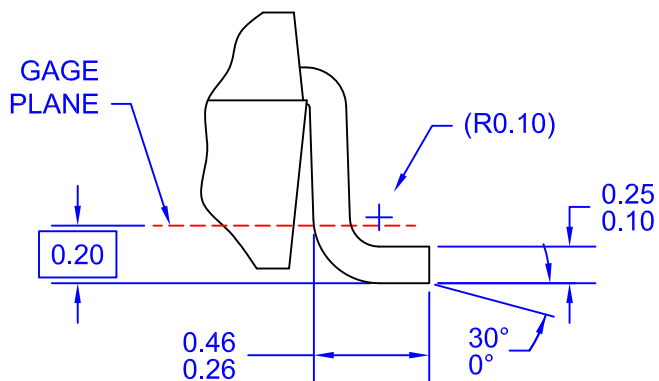


NOTES: UNLESS OTHERWISE SPECIFIED
 A) THIS PACKAGE CONFORMS TO EIAJ SC-88, 1996.

B) ALL DIMENSIONS ARE IN MILLIMETERS.
 C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH.

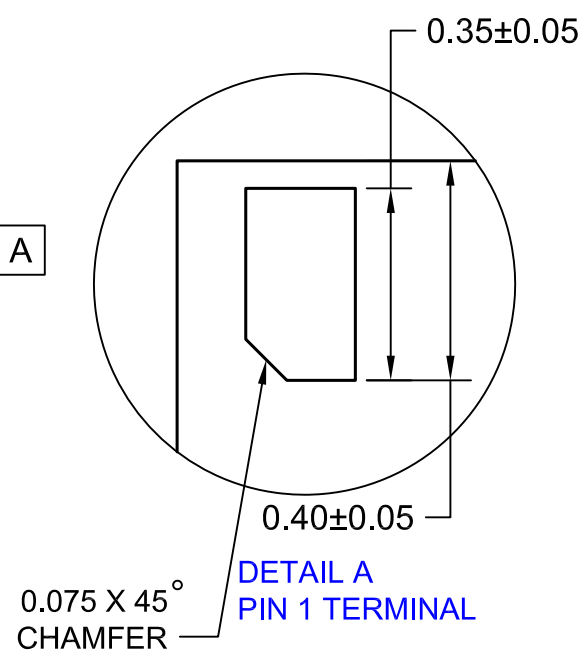
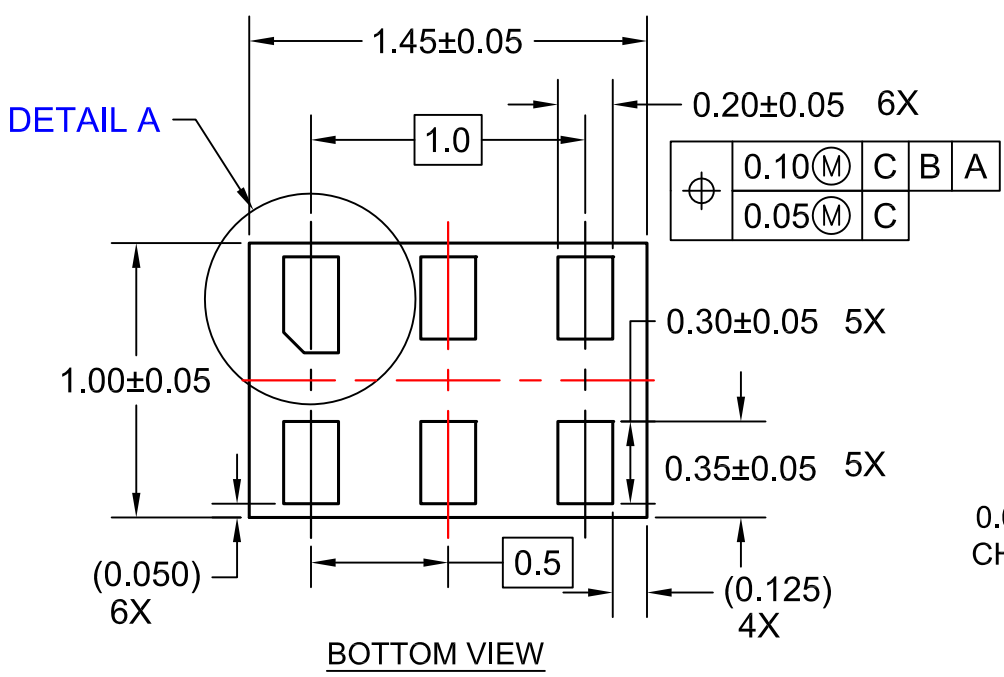
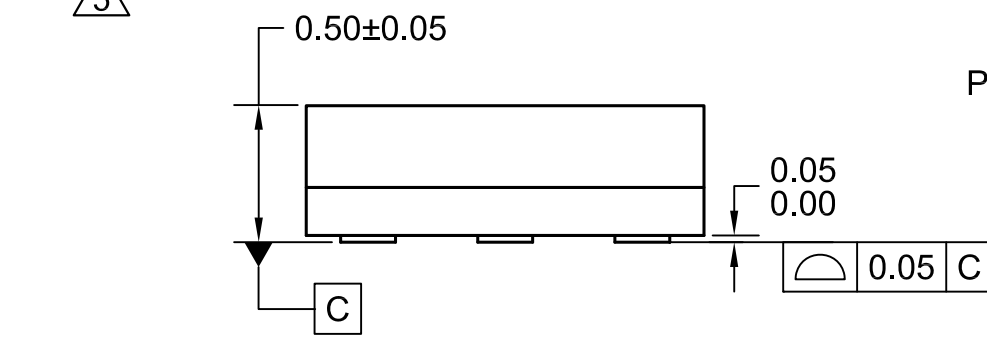
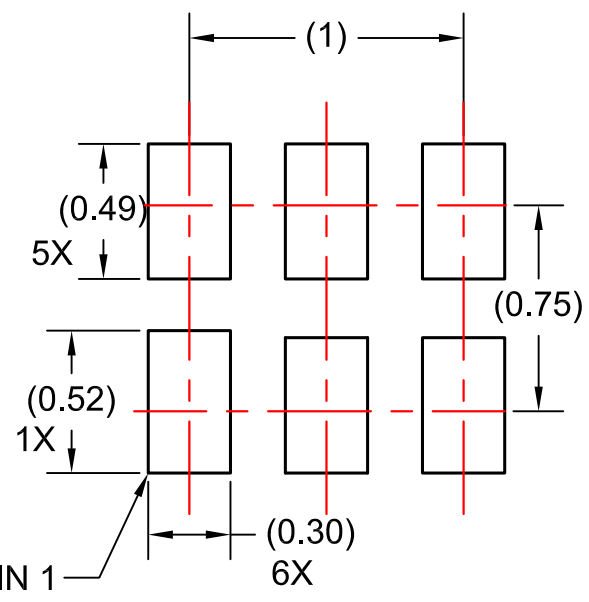
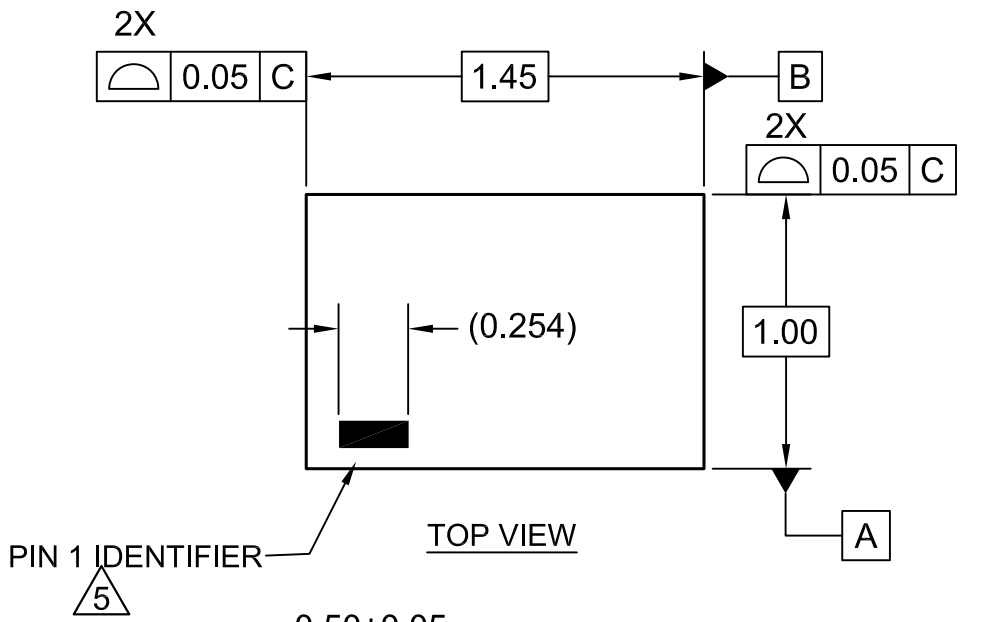
D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009

E) DRAWING FILENAME: MKT-MAA06AREV7



DETAIL A
 SCALE: 60X





NOTES:

1. CONFORMS TO JEDEC STANDARD MO-252 VARIATION UAAD
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y14.5M-2009
4. LANDPATTERN RECOMMENDATION PER FSC
5. PIN ONE IDENTIFIER IS 2X LENGTH OF ANY OTHER LINE IN THE MARK CODE LAYOUT.
6. FILENAME AND REVISION: MAC06AREV6



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. 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

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
Order Literature: <http://www.onsemi.com/orderlit>
For additional information, please contact your local
Sales Representative