

# FSA1256(A) / FSA1257(A) / FSA1258(A)

## Low-R<sub>ON</sub> Low-Voltage, Dual SPST Analog Switch with Low-I<sub>CCT</sub> “A” Option

### Features

- FSA1256A, FSA1257A, FSA1258A feature low I<sub>CCT</sub> when S Input is lower than V<sub>CC</sub>
- Maximum 1.1Ω On Resistance (R<sub>ON</sub>) for 4.5V supply
- 0.4Ω max R<sub>ON</sub> flatness for 4.5V supply
- Space saving Pb-Free MicroPak™ packaging
- Broad V<sub>CC</sub> operating range:
- FSA1256, FSA1257, FSA1258: 1.65V to 5.5V
- FSA1256A, FSA1257A, FSA1258A: 2.7V to 5.5V
- Fast turn-on and turn-off time
- FSA1258, FSA1258A feature break-before-make enable circuitry
- Over-voltage tolerant TTL compatible control input

### Applications

- Cell Phone, PDA, Digital Camera, and Notebook
- LCD Monitor, TV, and Set-Top Box

### Description


The FSA1256, FSA1256A, FSA1257, FSA1257A, FSA1258, and FSA1258A are high performance dual Single Pole/Single Throw (SPST) analog switches. All devices feature ultra low R<sub>ON</sub> of 1.1Ω maximum at 4.5V V<sub>CC</sub>. The FSA1256, FSA1257, and FSA1258 operate over a wide V<sub>CC</sub> range of 1.65V to 5.5V. The FSA1256A, FSA1257A, and FSA1258A operation range is 2.7V to 5.5V. These devices are fabricated with sub-micron CMOS technology to achieve fast switching speeds and are designed for break-before-make operation. The select input is TTL level compatible. The FSA1256 and FSA1256A feature two Normally Open (NO) switches. The FSA1257 and FSA1257A feature two Normally Closed (NC) switches. The FSA1258 and FSA1258A have one NO switch and one NC switch.

### IMPORTANT NOTE:

For additional performance information, please contact [analogswitch@fairchildsemi.com](mailto:analogswitch@fairchildsemi.com).

### Ordering Information

Part Number	Top Mark	Package Description	Packing Method
FSA1256L8X	EB	8-Lead, MicroPak™, 1.6mm Wide	5000 Units Tape and Reel
FSA1256AL8X	FN	8-Lead, MicroPak™, 1.6mm Wide	5000 Units Tape and Reel
FSA1257L8X	EC	8-Lead, MicroPak™, 1.6mm Wide	5000 Units Tape and Reel
FSA1257AL8X	FP	8-Lead, MicroPak™, 1.6mm Wide	5000 Units Tape and Reel
FSA1258L8X	ED	8-Lead, MicroPak™, 1.6mm Wide	5000 Units Tape and Reel
FSA1258AL8X	FS	8-Lead, MicroPak™, 1.6mm Wide	5000 Units Tape and Reel

 All packages are lead free per JEDEC: J-STD-020B standard.

MicroPak™ is a trademark of Fairchild Semiconductor Corporation.

## Analog Symbols

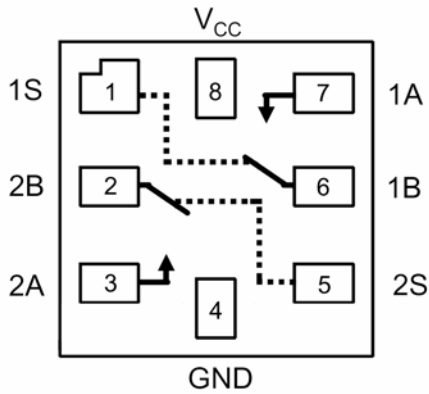


Figure 1. FSA1256, FSA1256A

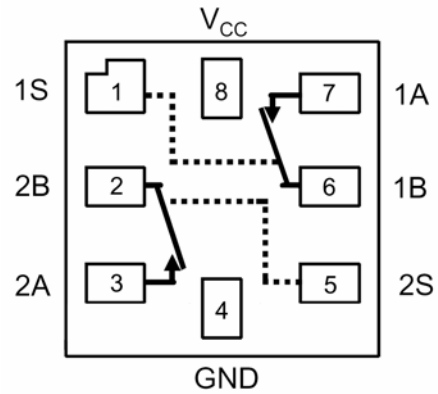


Figure 2. FSA1257, FSA1257A

## Truth Tables

Control Input (s)	Function
LOW Logic Level	Disconnect
HIGH Logic Level	A Connected to B

Control Input (s)	Function
LOW Logic Level	A Connected to B
HIGH Logic Level	Disconnected

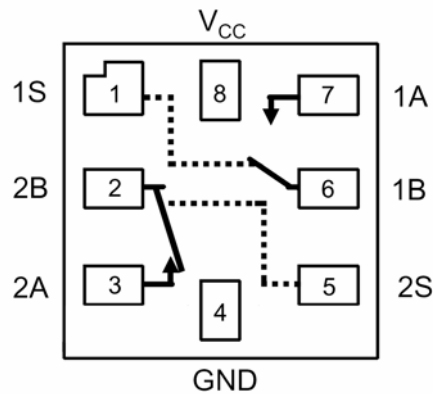


Figure 3. FSA1258, FSA1258A

## Truth Table

Control Input, 1S	Function	Control Input 2S	Function
LOW Logic Level	1A Connected to 1 B	LOW Logic Level	Disconnect
HIGH Logic Level	Disconnect	HIGH Logic Level	2A Connected to 2B

## Pin Descriptions

Name	Description
A, B <sub>0</sub> , B <sub>1</sub>	Data Ports
S	Switch Select Pin

## 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.	Units
V <sub>CC</sub>	Supply Voltage	-0.5	6.0	V
V <sub>S</sub>	Switch Voltage <sup>(1)</sup>	-0.5	V <sub>CC</sub> +0.5	V
V <sub>in</sub>	Input Voltage <sup>(1)</sup>	-0.5	6.0	V
	Power Dissipation at 85°C, MicroPak™ 8L Package		180	mW
I <sub>IK</sub>	Input Diode Current		-50	mA
I <sub>SW</sub>	Switch Current		200	mA
I <sub>SWPEAK</sub>	Peak Switch Current (Pulsed at 1ms Duration, <10% Duty Cycle)		400	mA
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	Human Body Model (JEDEC: JESD22-A114)	FSA1256, FSA1257, FSA1258	5.5	kV
		FSA1256A, FSA1257A, FSA1258A	4.5	

### 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.	Units	
V <sub>CC</sub>	Supply Voltage	FSA1256, FSA1257, FSA1258	1.65	5.50	V
		FSA1256A, FSA1257A, FSA1258A	2.7	5.5	
V <sub>IN</sub>	Control Input Voltage <sup>(2)</sup>	0	V <sub>CC</sub>	V	
V <sub>IN</sub>	Switch Input Voltage	0	V <sub>CC</sub>	V	
θ <sub>JA</sub>	Thermal Resistance in Still Air, MicroPak 8L Package (modeled)		224	°C/W	
T <sub>A</sub>	Operating Temperature	-40	+85	°C	

### Note:

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

## DC Electrical Characteristics

All typical values are at 25°C unless otherwise specified. The 1.65V to 1.95V range applies to FSA1256, FSA1257, and FSA1258 only.

Symbol	Parameter	Conditions	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 <sup>(3)</sup>		4.5 to 5.5				2.4		V
			2.7 to 3.6				2.0		
			1.65 to 1.95				0.9		
V <sub>IL</sub>	Input Voltage Low <sup>(3)</sup>	FSA1256A, FSA1257A, FSA1258A Only	4.5 to 5.5					0.8	V
			2.7 to 3.6					0.4	
			2.7 to 3.6					0.6	
			1.65 to 1.95					0.4	
I <sub>IN</sub>	Control Input Leakage (S)	V <sub>IN</sub> =0 to V <sub>CC</sub>	1.95 to 5.5				-1	1	μA
I <sub>NO(OFF)</sub> , I <sub>NC(OFF)</sub>	Off Leakage Current	A=1V, 4.5V 1B or 2B=1V, 4.5V	5.5	-2		2	-20	20	nA
R <sub>ON</sub>	Switch On Resistance <sup>(3,4)</sup>	I <sub>OUT</sub> =100mA, 1B or 2B=3.5V	4.5		0.95	1.15		1.30	Ω
		I <sub>OUT</sub> =100mA, 1B or 2B=1.5V	2.7		2.6	4.0		4.3	
		I <sub>OUT</sub> =100mA, 1B or 2B=1.2V	1.65		8.0	9.5		10.5	
ΔR <sub>ON</sub>	On Resistance Matching Between Channels <sup>(3,5)</sup>	I <sub>OUT</sub> =100mA, 1B or 2B=3.5V	4.5		0.06	0.12		0.15	Ω
R <sub>FLAT(ON)</sub>	On Resistance Flatness <sup>(3,6)</sup>	I <sub>OUT</sub> =100mA, 1B or 2B=0V, 1.0V, 2.0V	4.5		0.2	0.3		0.4	Ω
		I <sub>OUT</sub> =100mA, 1B or 2B=0V, 0.75V, 1.5V	2.7		1.4				
		I <sub>OUT</sub> =100mA, 1B or 2B=0V, 1.0V, 1.2V	1.65		1.8				
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> =0V or V <sub>CC</sub> , I <sub>OUT</sub> =0V	5.5		0.1	0.5		1.0	μA
			3.6		0.1	0.5		1.0	
I <sub>CC</sub> T	Increase in I <sub>CC</sub> per Input	One Input at 2.6V, Others at V <sub>CC</sub> or GND (FSA1256A, FSA1257A, FSA1258A Only)	4.3		0.2			10.0	μA

### Notes:

- Guaranteed, but not tested for V<sub>CC</sub>=1.65V.
- 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 (R<sub>ON</sub>) over the specified range of conditions.

## AC Electrical Characteristics

All typical values are at 25°C unless otherwise specified. The 1.65V to 1.95V range applies to FSA1256, FSA1257, and FSA1258 only.

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	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 <sup>(7)</sup>	1B or 2B=3.0V, R <sub>L</sub> =50Ω, C <sub>L</sub> =35pF	4.5 to 5.5		10	35		40	ns	8
		1B or 2B=1.5V, R <sub>L</sub> =50Ω, C <sub>L</sub> =35pF	2.7 to 3.6		15	50		60		
		1B or 2B=1.0V R <sub>L</sub> =50Ω, C <sub>L</sub> =35pF	1.65 to 1.95		35	110		120		
t <sub>OFF</sub>	Turn-Off Time <sup>(7)</sup>	1B or 2B=3.0V, R <sub>L</sub> =50Ω, C <sub>L</sub> =35pF	4.5 to 5.5		4	15		20	ns	8
		1B or 2B=1.5V, R <sub>L</sub> =50Ω, C <sub>L</sub> =35pF	2.7 to 3.6		8	20		30		
		1B or 2B=1.0V R <sub>L</sub> =50Ω, C <sub>L</sub> =35pF	1.65 to 1.95		10	30		40		
t <sub>BMM</sub>	Break-Before-Make Time <sup>(7)</sup>	1B or 2B=3.0V, R <sub>L</sub> =50Ω, C <sub>L</sub> =35pF	4.5 to 5.5		7				ns	9
		1B or 2B=1.5V, R <sub>L</sub> =50Ω, C <sub>L</sub> =35pF	2.7 to 3.6		12					
Q	Charge Injection <sup>(7)</sup>	C <sub>L</sub> =1.0nF, V <sub>GEN</sub> =0V, R <sub>GEN</sub> =0Ω	4.5 to 5.5		20				pC	13
			2.7 to 3.6		10					
			1.65 to 1.95		5					
OIRR	Off Isolation <sup>(7)</sup>	f=1MHz, R <sub>L</sub> =50Ω,	1.65 to 5.5		-70				dB	11
Xtalk	Crosstalk <sup>(7)</sup>	f=1MHz, R <sub>L</sub> =50Ω,	1.65 to 4.3		-100				dB	12
BW	-3db Bandwidth <sup>(7)</sup>	R <sub>L</sub> =50Ω	1.65 to 4.3		300				MHz	10
THD	Total Harmonic Distortion <sup>(7)</sup>	f=20Hz to 20kHz, R <sub>L</sub> =600Ω, V <sub>IN</sub> =0.5V <sub>PP</sub>	1.65 to 4.3		0.002				%	16

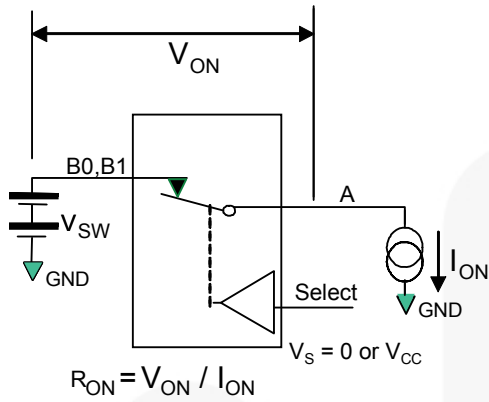
**Note:**

7. Guaranteed, but not tested for V<sub>CC</sub>=1.65V.

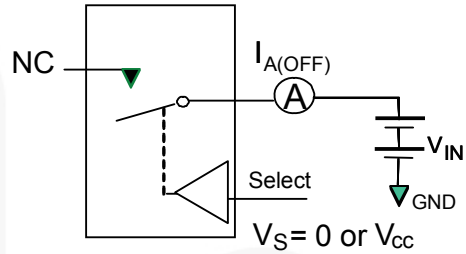
## Capacitance

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=1MHz	0		3.0		pF	15
C <sub>OFF</sub>	B Port Off Capacitance	f=1MHz	4.5		11.5		pF	14
C <sub>ON</sub>	A Port On Capacitance	f=1MHz	4.5		27.0		pF	15

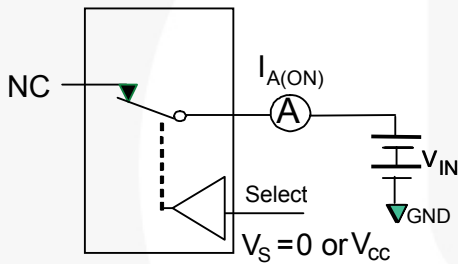
### Test Diagrams



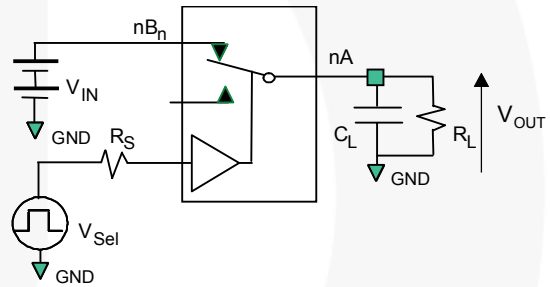
**Figure 4. On Resistance**



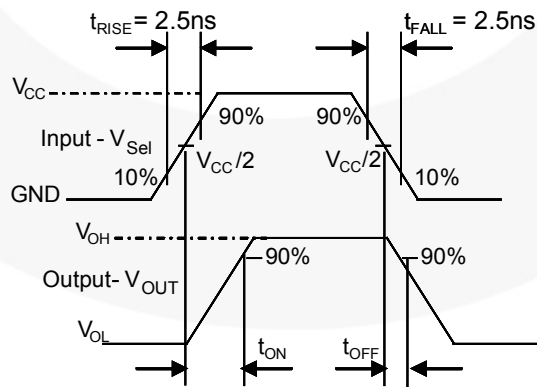
**Figure 5. Off Leakage (Ports Tested Separately)**



**Figure 6. On Leakage**

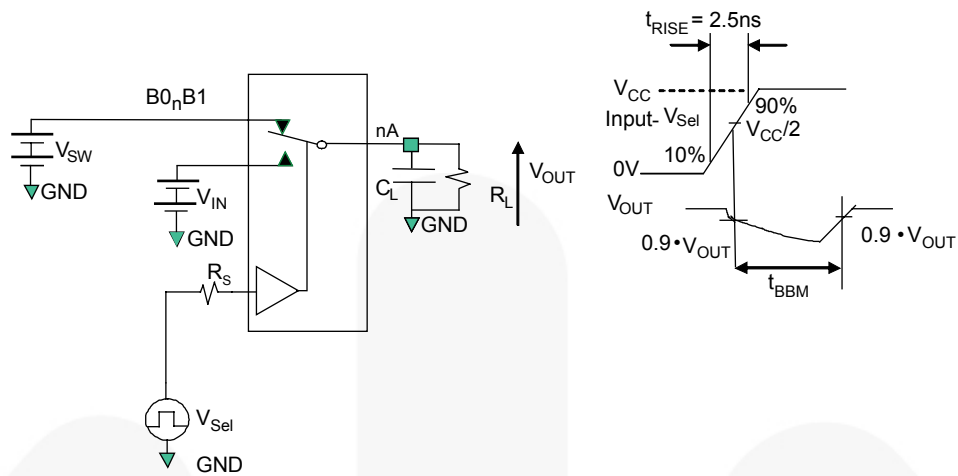


**Figure 7. Test Circuit Load**



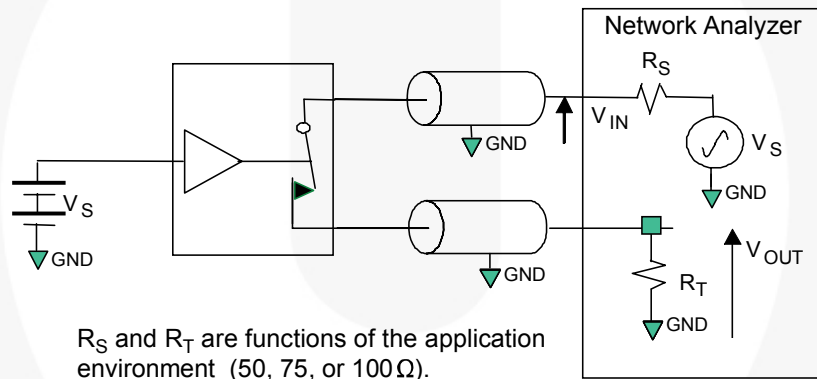
**Figure 8. Turn-On / Turn-Off Waveforms**

**Test Diagrams** (Continued)



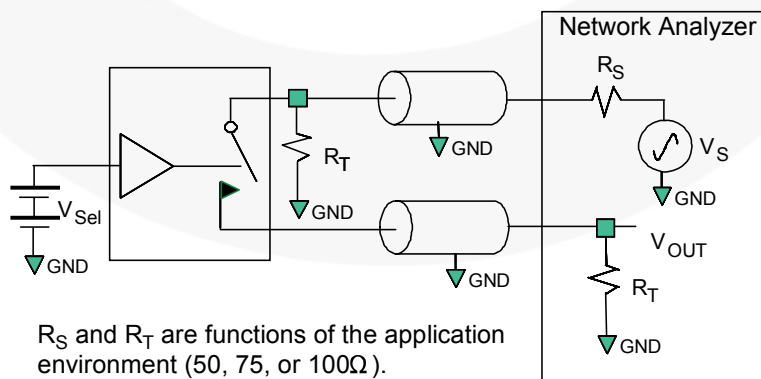
$R_L$  and  $C_L$  are functions of the application environment (50Ω, 75Ω, or 100Ω).  
 $C_L$  includes test fixture and stray capacitance.

**Figure 9. Break-Before-Make Interval Timing**



$R_S$  and  $R_T$  are functions of the application environment (50, 75, or 100Ω).

**Figure 10. Bandwidth**

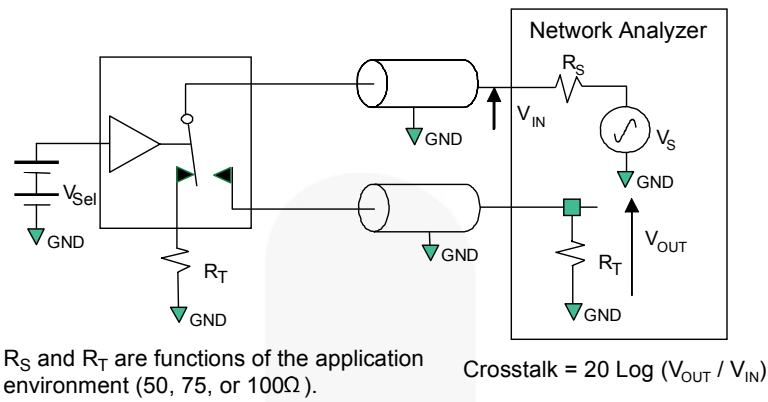


$R_S$  and  $R_T$  are functions of the application environment (50, 75, or 100Ω).

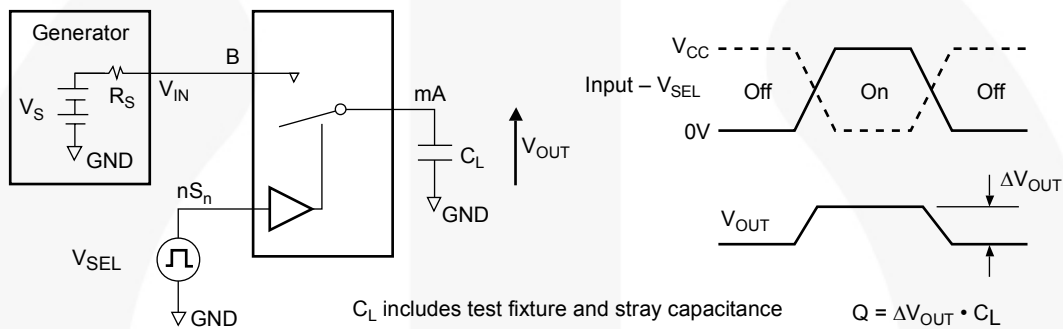
$$\text{Off Isolation} = 20 \text{ Log} (V_{\text{OUT}} / V_{\text{IN}})$$

**Figure 11. Channel Off Isolation**

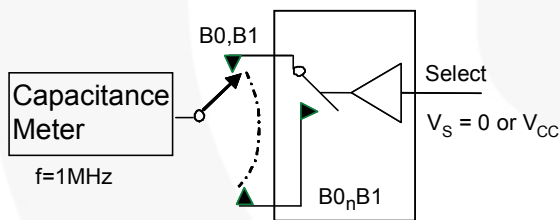
**Test Diagrams (Continued)**



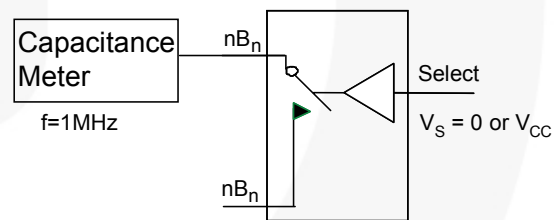
**Figure 12. Adjacent Channel Crosstalk**



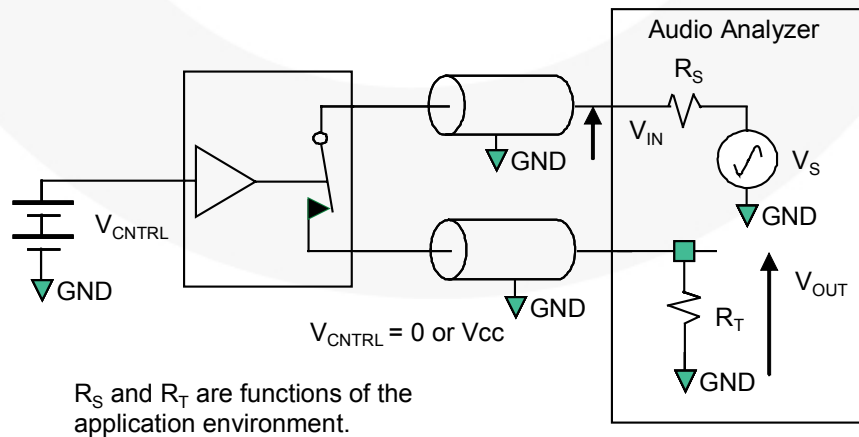
**Figure 13. Charge Injection Test**



**Figure 14. Channel Off Capacitance**



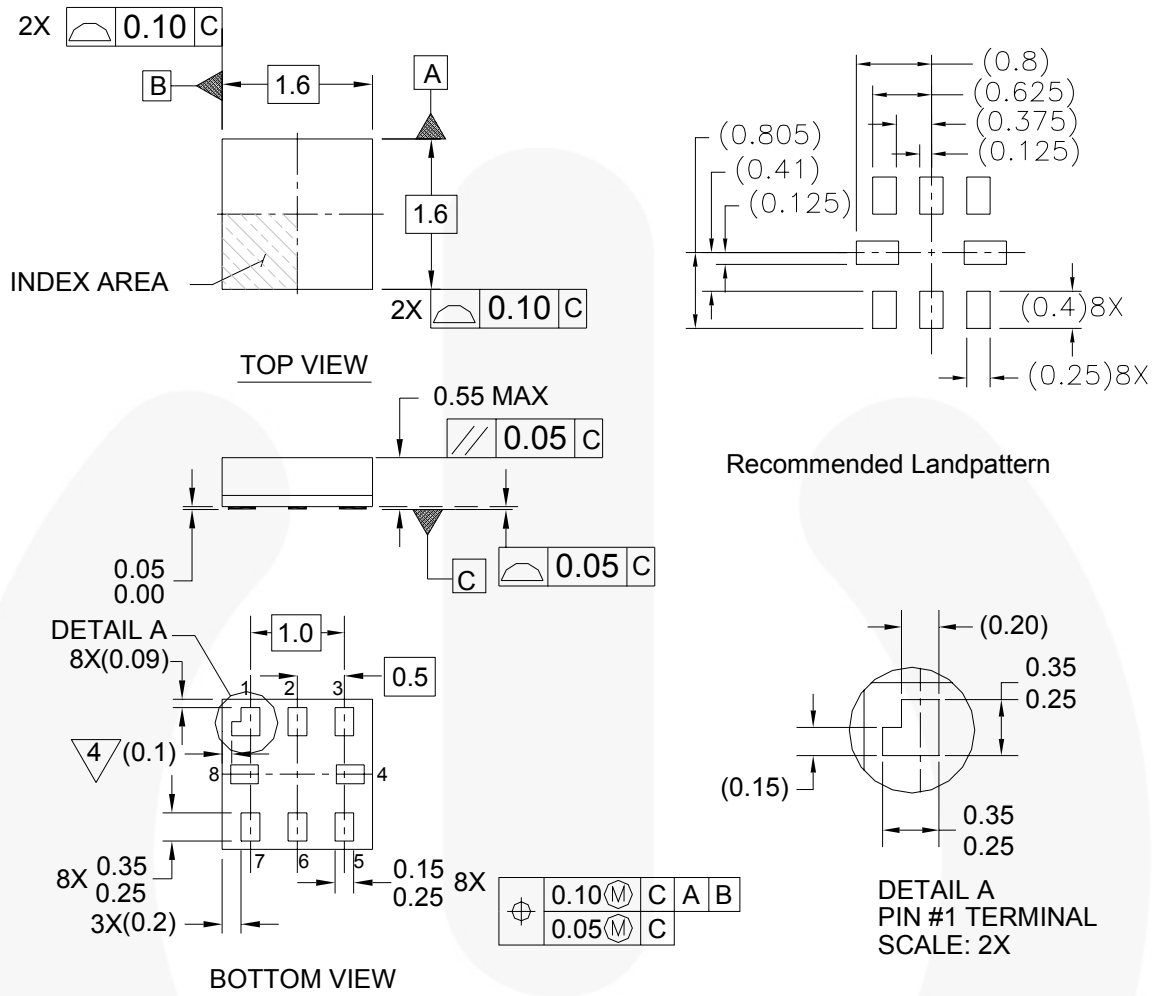
**Figure 15. Channel On Capacitance**



**Figure 16. Total Harmonic Distortion**



## Physical Dimensions



### Notes:

1. PACKAGE CONFORMS TO JEDEC MO-255 VARIATION UAAD
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y.14M-1994
4. PIN 1 FLAG, END OF PACKAGE OFFSET
5. DRAWING FILE NAME: MKT-MAC08AREV4

MAC08AREV4

**Figure 17. 8-Lead MicroPak™, 1.6mm Wide**

For tape and reel specifications for MicroPak, please visit:  
[http://www.fairchildsemi.com/products/logic/pdf/micropak\\_tr.pdf](http://www.fairchildsemi.com/products/logic/pdf/micropak_tr.pdf)





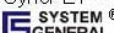
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Build it Now <sup>™</sup>	F-PFST <sup>™</sup>	Power-SPM <sup>™</sup>	
CorePLUS <sup>™</sup>	FRFET <sup>®</sup>	PowerTrench <sup>®</sup>	TinyBoost <sup>™</sup>
CorePOWER <sup>™</sup>	Global Power Resource <sup>SM</sup>	Programmable Active Droop <sup>™</sup>	TinyBuck <sup>™</sup>
CROSSVOLT <sup>™</sup>	Green FPS <sup>™</sup>	QFET <sup>®</sup>	TinyLogic <sup>®</sup>
CTL <sup>™</sup>	Green FPS <sup>™</sup> e-Series <sup>™</sup>	QS <sup>™</sup>	TINYOPTO <sup>™</sup>
Current Transfer Logic <sup>™</sup>	GTO <sup>™</sup>	Quiet Series <sup>™</sup>	TinyPower <sup>™</sup>
EcoSPARK <sup>®</sup>	IntelliMAX <sup>™</sup>	RapidConfigure <sup>™</sup>	TinyPWM <sup>™</sup>
EfficientMax <sup>™</sup>	ISOPLANAR <sup>™</sup>	Saving our world, 1mW at a time <sup>™</sup>	TinyWire <sup>™</sup>
EZSWITCH <sup>™</sup> *	MegaBuck <sup>™</sup>	SmartMax <sup>™</sup>	μSerDes <sup>™</sup>
	MICROCOUPLER <sup>™</sup>	SMART START <sup>™</sup>	
	MicroFET <sup>™</sup>	SPM <sup>®</sup>	UHC <sup>®</sup>
Fairchild <sup>®</sup>	MicroPak <sup>™</sup>	STEALTH <sup>™</sup>	Ultra FRFET <sup>™</sup>
Fairchild Semiconductor <sup>®</sup>	MillerDrive <sup>™</sup>	SuperFET <sup>™</sup>	UniFET <sup>™</sup>
FACT Quiet Series <sup>™</sup>	MotionMax <sup>™</sup>	SuperSOT <sup>™</sup> -3	VCX <sup>™</sup>
FACT <sup>®</sup>	Motion-SPM <sup>™</sup>	SuperSOT <sup>™</sup> -6	VisualMax <sup>™</sup>
FAST <sup>®</sup>	OPTOLOGIC <sup>®</sup>	SuperSOT <sup>™</sup> -8	
FastvCore <sup>™</sup>	OPTOPLANAR <sup>®</sup>	SupreMOS <sup>™</sup>	
FlashWriter <sup>®</sup> *		SyncFET <sup>™</sup>	
			

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Datasheet Identification	Product Status	Definition
Advance Information	Formative / 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; 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 the design.
Obsolete	Not In Production	This datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

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