



Is Now Part of



**ON Semiconductor®**

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

[www.onsemi.com](http://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](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.

# FSA2268 / FSA2268T Low-Voltage Dual-SPDT (0.4Ω) Analog Switch with 16kV ESD

## Features

- 0.4Ω Typical On Resistance ( $R_{ON}$ ) for +3.0V Supply
- 0.25Ω Maximum  $R_{ON}$  Flatness for +3.0V Supply
- -3db Bandwidth: > 50MHz
- Low  $I_{CCT}$  Current Over an Expanded Control Input Range
- Packaged in Pb-free 10-Lead  $\mu$ MLP (1.4 x 1.8mm)
- Power-Off Protection on Common Ports
- Broad  $V_{CC}$  Operating Range: 1.65 to 4.3V
- HBM JEDEC: JESD22-A114
  - I/O to GND: 13.5kV
  - Power to GND: 16.0kV
- Noise Immunity Termination Resistors in FSA2268T

## Applications

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

## Description

The FSA2268 is a high-performance, dual Single Pole Double Throw (SPDT) analog switch that features ultra-low  $R_{ON}$  of 0.4Ω (typical) at 3.0V  $V_{CC}$ . The FSA2268 operates over a wide  $V_{CC}$  range of 1.65V to 4.3V and is designed for break-before-make operation. The select input is TTL-level compatible.

The FSA2268 features very low quiescent current even when the control voltage is lower than the  $V_{CC}$  supply. This feature suits mobile handset applications by allowing direct interface with baseband processor general-purpose I/Os with minimal battery consumption.

The FSA2268T includes termination resistors that improve noise immunity during overshoot excursions, off-isolation coupling, or “pop-minimization.”

## IMPORTANT NOTE:

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

## Ordering Information

Part Number	Top Mark	Package Description
FSA2268UMX	GF	10-Lead, Quad Ultrathin Molded Leadless Package (UMLP), 1.4 x 1.8mm, 0.4mm Pitch
FSA2268TUMX	GH	10-Lead, Quad Ultrathin Molded Leadless Package (UMLP), 1.4 x 1.8mm, 0.4mm Pitch
FSA2268L10X	GH	10-Lead, MicroPak™, 1.6mm Wide

## Analog Symbols

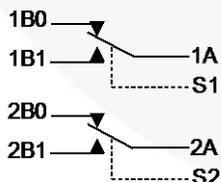


Figure 1. FSA2268

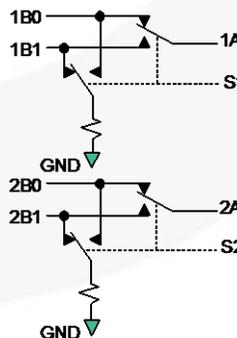


Figure 2. FSA2268T (with Noise Termination Resistors)

## Pin Configuration

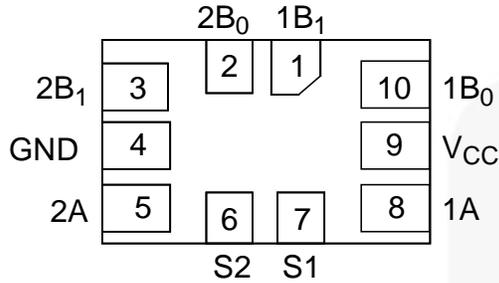


Figure 3. Pin Assignment 10-Pin UMLP (Top-Through View)

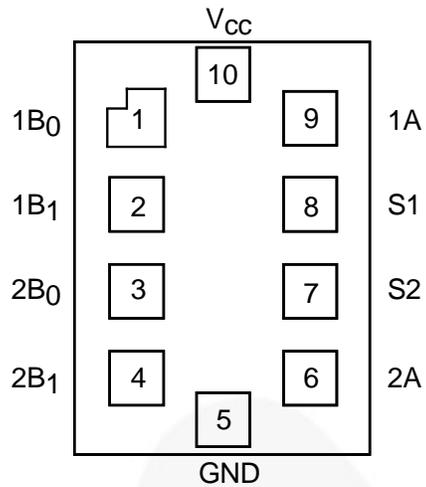


Figure 4. 10-Lead MicroPak™

## Pin Descriptions

Pin # UMLP	Pin # MicroPak™	Name	Description
1	2	1B <sub>1</sub>	Data Ports
2	3	2B <sub>0</sub>	Data Ports
3	4	2B <sub>1</sub>	Data Ports
4	5	GND	Ground
5	6	2A	Data Ports
6	7	S2	Switch Select Pins
7	8	S1	Switch Select Pins
8	9	1A	Data Ports
9	10	V <sub>CC</sub>	Supply Voltage
10	1	1B <sub>0</sub>	Data Ports

## Truth Table

Control Input, S <sub>n</sub>	Function
LOW Logic Level	nB <sub>0</sub> connected to nA (FSA2268/2268T); nB <sub>1</sub> terminated to GND (FSA2268T only)
HIGH Logic Level	nB <sub>1</sub> connected to nA (FSA2268/2268T); nB <sub>0</sub> terminated to GND (FSA2268T only)

## 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	
$V_{CC}$	Supply Voltage	-0.5	5.5	V	
$V_{SW}$	Switch I/O Voltage <sup>(1)</sup>	1B0, 1B1, 2B0, 2B1, 1A, 2A Pins	-0.5	$V_{CC} + 0.3$	V
		T Version nBn Pin Off	0	1.4	
$V_{IN}$	Control Input Voltage <sup>(1)</sup>	-0.5	5.5	V	
$I_{IK}$	Input Clamp Diode Current		-50	mA	
$I_{SW}$	Switch I/O Current (Continuous)		350	mA	
$I_{SWPEAK}$	Peak Switch Current (Pulsed at 1ms Duration, <10% Duty Cycle)		500	mA	
$T_{STG}$	Storage Temperature Range	-65	+150	°C	
$T_J$	Maximum Junction Temperature		+150	°C	
$T_L$	Lead Temperature (Soldering, 10 seconds)		+260	°C	
MSL	Moisture Sensitivity Level (JEDEC J-STD-020A)		1	Level	
ESD	Human Body Model, JEDEC: JESD22-A114	I/O to GND		13.5	kV
		Power to GND		16.0	
		All Other Pins		9.0	
	Charged Device Model, JEDEC: JESD22-C101			2.0	kV

**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.	Units
$V_{CC}$	Supply Voltage	1.65	4.30	V
$V_{IN}$	Control Input Voltage	0	$V_{CC}$	V
$V_{SW}$	Switch I/O Voltage	0	$V_{CC}$	V
$T_A$	Operating Temperature	-40	+85	°C

## DC Electrical Characteristics

All 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 to +85°C		Unit
				Min.	Typ.	Max.	Min.	Max.	
V <sub>IH</sub>	Input Voltage High		3.6 to 4.3				1.7		V
			2.7 to 3.6				1.5		
			2.3 to 2.7				1.4		
			1.65 to 1.95				0.9		
V <sub>IL</sub>	Input Voltage Low		3.6 to 4.3					0.7	V
			2.7 to 3.6					0.5	V
			2.3 to 2.7					0.4	
			1.65 to 1.95					0.4	
I <sub>IN</sub>	Control Input Leakage (S1,S2)	V <sub>IN</sub> =0 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> FSA2268	Off Leakage Current of Port nB0 and nB1	nA=0.3V, V <sub>CC</sub> =0.3V nB0 or nB1=V <sub>CC</sub> -0.3V, 0.3V, or Floating Figure 6	1.95 to 4.30	-10		10	-50	50	nA
I <sub>NC(OFF)</sub> FSA2268T	Off Leakage Current of Port nB0 and nB1 (with Termination Resistors)	nA=0.3V, nB0 or nB1=0V or Floating Figure 6	1.95 to 4.30	-10		10	-50	50	μA
I <sub>A(ON)</sub>	On Leakage Current of Port nA	nA=0.3V, V <sub>CC</sub> =0.3V nB0 or nB1=V <sub>CC</sub> -0.3V, 0.3V, or Floating Figure 7	1.95 to 4.30	-20		20	-100	100	nA
I <sub>OFF</sub> FSA2268	Power-Off Leakage Current (Common Port Only 1A, 2A)	Common Port (1A, 2A), V <sub>IN</sub> =0V to 4.3V, V <sub>CC</sub> =0V nB0, nB1=Floating	0V					±1	μA
I <sub>OFF</sub> FSA2268T	Power-Off Leakage Current (Common Port Only 1A, 2A)	Common Port (1A, 2A), V <sub>IN</sub> =0V to 4.3V, V <sub>CC</sub> =0V nB0, nB1=0V or Floating	0V					±40	μA
R <sub>ON</sub>	Switch On Resistance <sup>(2)(5)</sup>	I <sub>ON</sub> =100mA, nB0 or nB1=0.7V, 3.6V Figure 5	4.30		0.30			0.50	Ω
		I <sub>ON</sub> =100mA, nB0 or nB1=0.7V, 2.3V Figure 5	3.00		0.40			0.55	
		I <sub>ON</sub> =100mA, nB0 or nB1=0V, 0.7V, 1.6V, 2.3V Figure 5	2.30		0.52				
		I <sub>ON</sub> =100mA, nB0 or nB1=0V, 0.7V, 1.65V Figure 5	1.65		1.00				
ΔR <sub>ON</sub>	On Resistance Matching Between Channels <sup>(3)(5)</sup>	I <sub>ON</sub> =100mA, nB0 or nB1=0.7V	4.30		0.04			0.13	Ω
			3.00		0.06			0.13	
			2.30		0.12				
			1.65		1.00				

Continued on following page...

### DC Electrical Characteristics (Continued)

All 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 to +85°C		Unit
				Min.	Typ.	Max.	Min.	Max.	
R <sub>FLAT(ON)</sub>	On Resistance Flatness <sup>(4)(5)</sup>	I <sub>OUT</sub> =100mA, nB0 or nB1=0V to V <sub>CC</sub>	4.30					0.25	Ω
			3.00					0.25	
			2.30		0.5				
			1.65		0.6				
R <sub>TERM</sub>	Internal Termination Resistors <sup>(6)</sup>				200				Ω
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> =0 or V <sub>CC</sub> , I <sub>OUT</sub> =0	4.30	-100		100	-500	500	nA
I <sub>CC</sub> T	Increase in I <sub>CC</sub> per Input	Input at 2.6V	4.30		3			7	μA
		Input at 1.8V			7			15	

**Notes:**

2. On resistance is determined by the voltage drop between A and B pins at the indicated current through the switch.
3.  $\Delta R_{ON} = R_{ON\ max} - R_{ON\ min}$  measured at identical V<sub>CC</sub>, temperature, and voltage.
4. 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.
5. Guaranteed by characterization, not production tested, for V<sub>CC</sub>=1.65-3.00V.
6. Guaranteed by characterization, not production tested.

## AC Electrical Characteristics

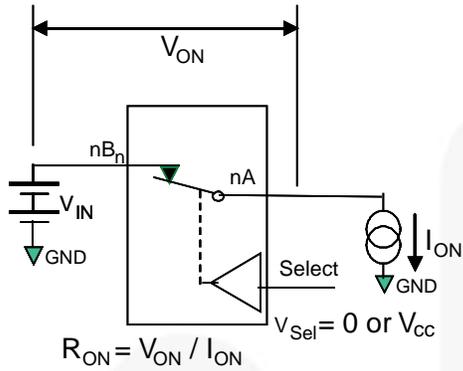
All typical value are for  $V_{CC}=3.3V$  at  $25^{\circ}C$  unless otherwise specified.

Symbol	Parameter	Conditions	$V_{CC}$ (V)	$T_A=+25^{\circ}C$			$T_A=-40$ to $+85^{\circ}C$		Unit	Figure
				Min.	Typ.	Max.	Min.	Max.		
$t_{ON}$	Turn-On Time	nB0 or nB1=1.5V, $R_L=50\Omega$ , $C_L=35pF$	3.6 to 4.3			55	15	60	ns	Figure 8 Figure 9
			2.7 to 3.6			60	15	65		
			2.3 to 2.7			65	15	70		
			1.65 to 1.95		70					
$t_{OFF}$	Turn-Off Time	nB0 or nB1=1.5V, $R_L=50\Omega$ , $C_L=35pF$	3.6 to 4.3			30	5	35	ns	Figure 8 Figure 9
			2.7 to 3.6			35	5	40		
			2.3 to 2.7			40	5	45		
			1.65 to 1.95		40					
$t_{BBM}$	Break-Before-Make Time	nB0 or nB1=1.5V, $R_L=50\Omega$ , $C_L=35pF$	3.6 to 4.3		15		2		ns	Figure 10
			2.7 to 3.6		15		2			
			2.3 to 2.7		15		2			
			1.65 to 1.95		16		2			
Q	Charge Injection	$C_L=1.0nF$ , $V_S=0V$ , $R_S=0\Omega$	1.65 to 4.30		25				pC	Figure 14
OIRR	Off Isolation	$f=100kHz$ , $R_L=50\Omega$ , $C_L=0pF$	1.65 to 4.30		-70				dB	Figure 12
Xtalk	Crosstalk	$f=100kHz$ , $R_L=50\Omega$ , $C_L=0pF$	1.65 to 4.30		-70				dB	Figure 13
BW	-3db Bandwidth	$R_L=50\Omega$ , $C_L=0pF$	1.65 to 4.30		>50				MHz	Figure 11
THD	Total Harmonic Distortion	$f=20Hz$ to $20kHz$ , $R_L=32\Omega$ , $V_{IN}=2V_{pp}$	1.65 to 4.30		.06				%	Figure 17

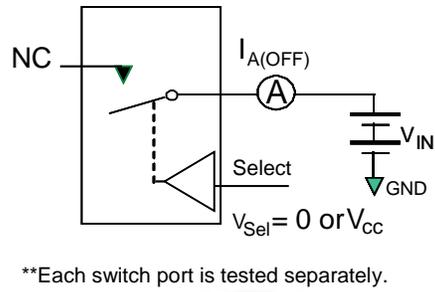
## Capacitance

Symbol	Parameter	Conditions	$V_{CC}$ (V)	$T_A=+25^{\circ}C$			Unit	Figure
				Min.	Typ.	Max.		
$C_{IN}$	Control Pin Input Capacitance	$f=1MHz$	0		1.5		pF	Figure 15
$C_{OFF}$	B Port Off Capacitance	$f=1MHz$	3.3		30		pF	Figure 15
$C_{ON}$	A Port On Capacitance	$f=1MHz$	3.3		120		pF	Figure 16

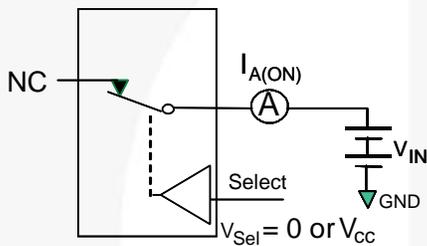
### Test Diagrams



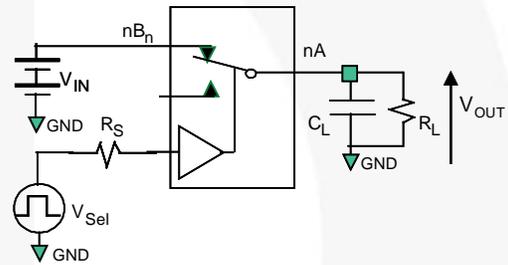
**Figure 5. On Resistance**



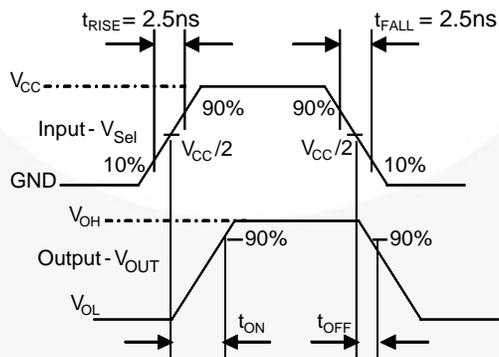
**Figure 6. Off Leakage (Ports tested separately)**



**Figure 7. On Leakage**

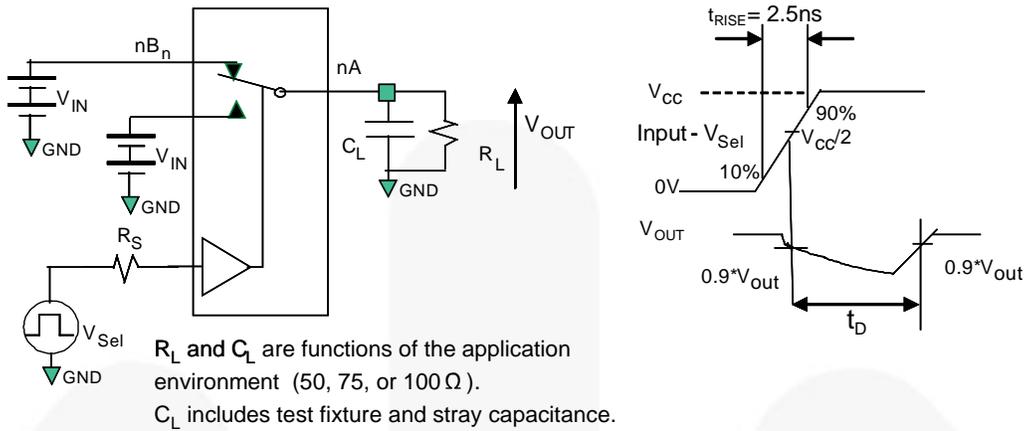


**Figure 8. Test Circuit Load**

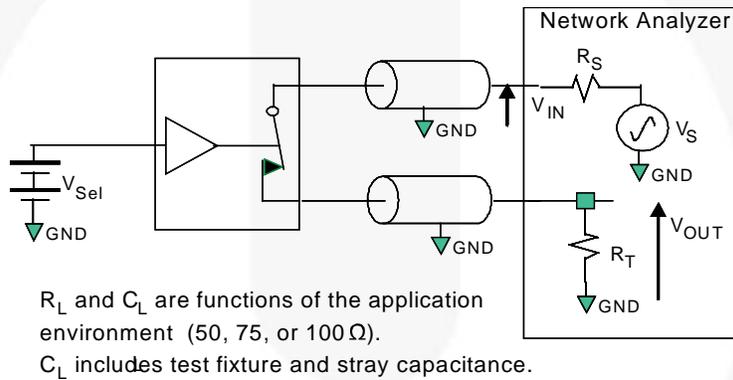


**Figure 9. Turn-On / Turn-Off Waveforms**

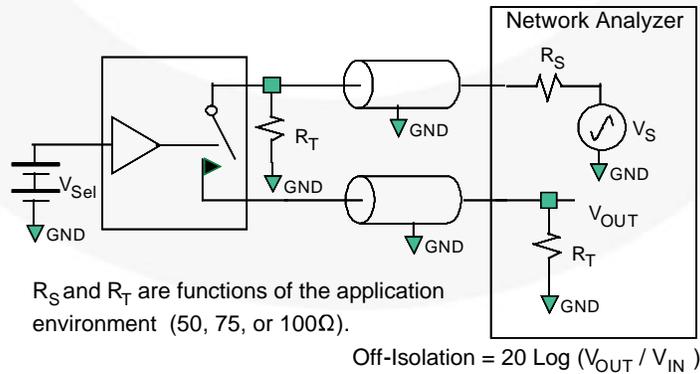
**Test Diagrams (Continued)**



**Figure 10. Break-Before-Make Interval Timing**

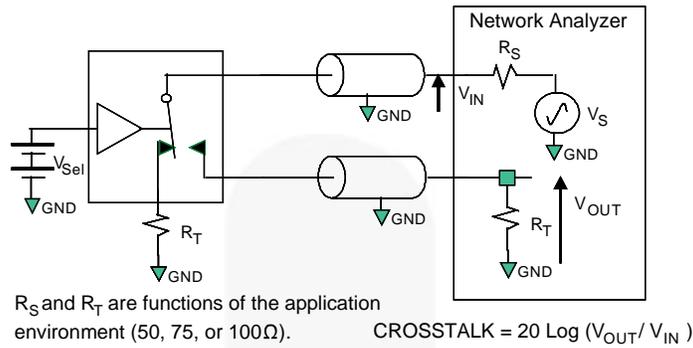


**Figure 11. Bandwidth**

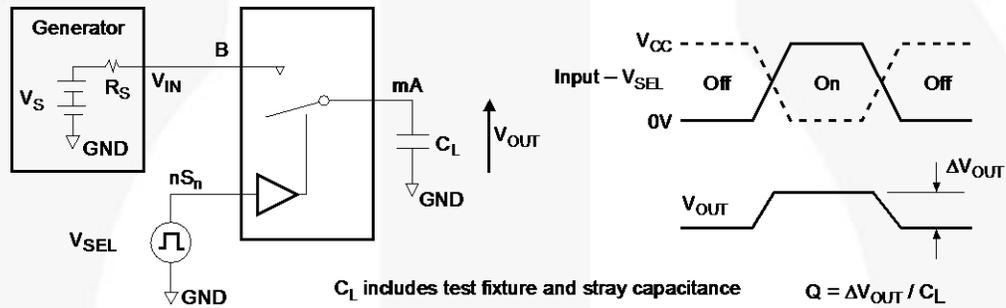


**Figure 12. Channel Off Isolation**

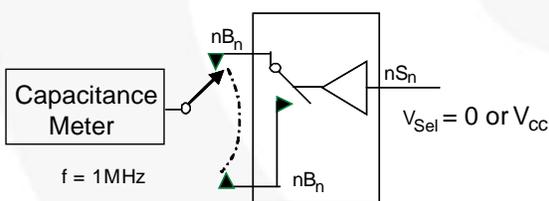
**Test Diagrams (Continued)**



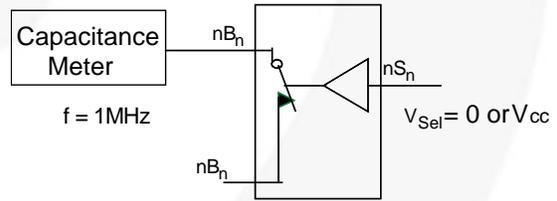
**Figure 13. Adjacent Channel Crosstalk**



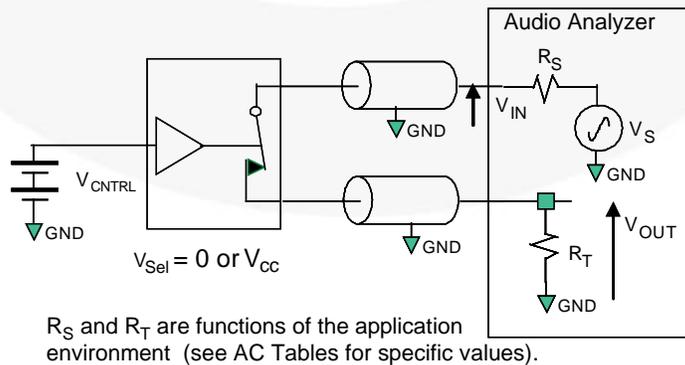
**Figure 14. Charge Injection Test**



**Figure 15. Channel Off Capacitance**

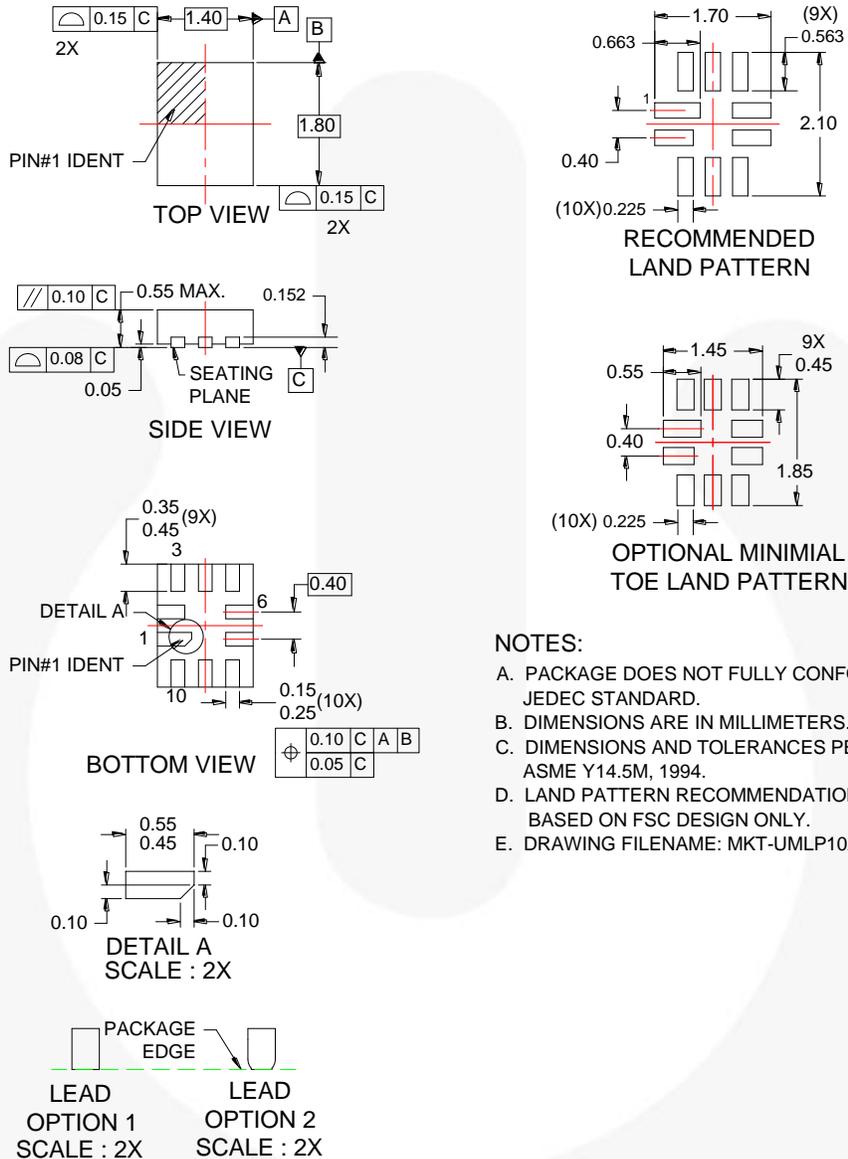


**Figure 16. Channel On Capacitance**



**Figure 17. Total Harmonic Distortion**

## Physical Dimensions



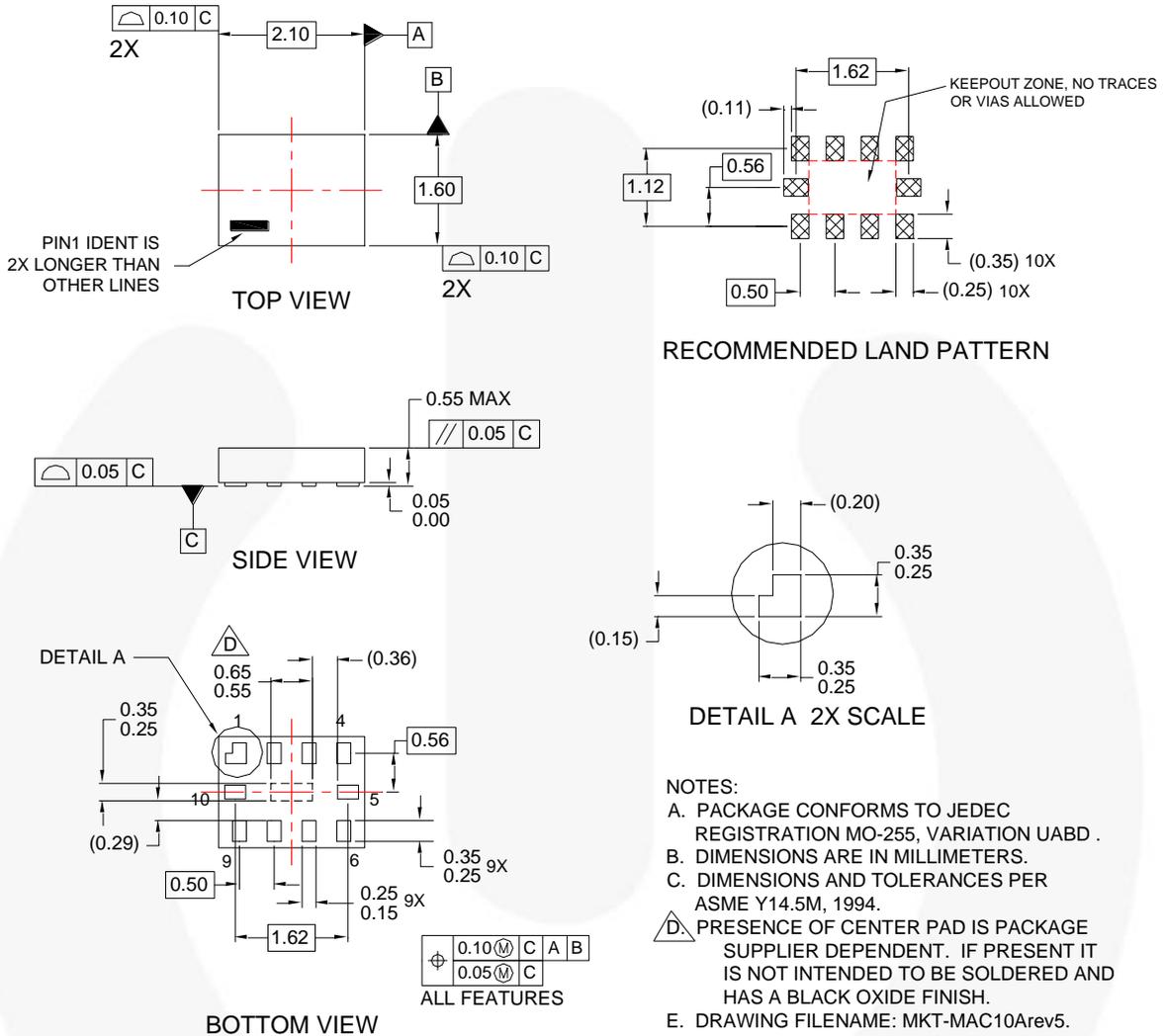
**Figure 18. 10-Lead Quad Ultrathin Molded Leadless Package (UMLP)**

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:  
<http://www.fairchildsemi.com/packaging/>

For current tape and reel specifications, visit Fairchild Semiconductor's online packaging area:  
[http://www.fairchildsemi.com/products/analog/pdf/UMLP10\\_TNR.pdf](http://www.fairchildsemi.com/products/analog/pdf/UMLP10_TNR.pdf)

**Physical Dimensions** (Continued)



**Figure 19. 10-Lead, MicroPak™, 1.6mm Wide**

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:  
<http://www.fairchildsemi.com/packaging/>

For current tape and reel specifications, visit Fairchild Semiconductor's online packaging area:  
[http://www.fairchildsemi.com/products/logic/pdf/micropak\\_tr.pdf](http://www.fairchildsemi.com/products/logic/pdf/micropak_tr.pdf)



**TRADEMARKS**

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

- |  |  |  |   |
|--|--|--|---|
| 2Cool™   | F-PFS™   | PowerTrench®   | The Power Franchise®  |
| AccuPower™   | FRFET®   | PowerXS™   | <b>the power franchise</b>  |
| AX-CAP™*   | Global Power Resource™                         | Programmable Active Droop™   | TinyBoost™  |
| BitSiC™  | GreenBridge™                                   | QFET®  | TinyBuck™   |
| Build it Now™  | Green FPS™                                     | QS™  | TinyCalc™   |
| CorePLUS™  | Green FPS™ e-Series™                           | Quiet Series™  | TinyLogic®  |
| CorePOWER™   | Gmax™  | RapidConfigure™  | TINYOPTO™   |
| CROSSVOLT™   | GTO™   |  ™                | TinyPower™  |
| CTL™   | IntelliMAX™                                    | Saving our world, 1mW/W/kW at a time™  | TinyPWM™  |
| Current Transfer Logic™  | ISOPLANAR™                                     | SignalWise™  | TinyWire™   |
| DEUXPEED®  | Making Small Speakers Sound Louder and Better™ | SmartMax™  | TranSiC™  |
| Dual Cool™   | MegaBuck™                                      | SMART START™   | TriFault Detect™  |
| EcoSPARK®  | MICROCOUPLER™                                  | Solutions for Your Success™  | TRUECURRENT®*   |
| EfficientMax™  | MicroFET™                                      | SPM®   | µSerDes™  |
| ESBC™  | MicroPak™                                      | STEALTH™   |  ™ |
|  Fairchild® | MicroPak2™                                     | SuperFET®  | UHC®  |
| Fairchild Semiconductor®   | MillerDrive™                                   | SuperSOT™-3  | Ultra FRFET™  |
| FACT Quiet Series™   | MotionMax™                                     | SuperSOT™-6  | UniFET™   |
| FACT®  | Motion-SPM™                                    | SuperSOT™-8  | VCX™  |
| FAST®  | mWSaver™                                       | SupreMOS®  | VisualMax™  |
| FastvCore™   | OptoHIT™                                       | SyncFET™   | VoltagePlus™  |
| FETBench™  | OPTOLOGIC®                                     | Sync-Lock™   | XS™   |
| FlashWriter®*  | OPTOPLANAR®                                    |  SYSTEM GENERAL®* |   |
| FPS™   |  |  |   |

\* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

**DISCLAIMER**

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

**LIFE SUPPORT POLICY**

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in 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.

**ANTI-COUNTERFEITING POLICY**

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, [www.fairchildsemi.com](http://www.fairchildsemi.com), under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

**PRODUCT STATUS DEFINITIONS**

**Definition of Terms**

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	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	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	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I61

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