FAIRCHILD SEMICONDUCTOR®

November 2009

FSA2269 / FSA2269TS — Low-Voltage Dual-SPDT (0.4Ω) Analog Switch with Negative Swing Audio Capability

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 10-Lead MicroPak™ and UMLP
- Power-Off Protection on Common Ports
- Broad V_{CC} Operating Range: 1.65 to 4.3V
- Noise Immunity Termination Resistors in FSA2269TS

Applications

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

Description

The FSA2269 is a high-performance, dual Single-Pole Double-Throw (SPDT) analog switch with negative swing audio capability. The FSA2269 features ultra-low R_{ON} of 0.4Ω (typical) at 3.0V V_{CC}. The FSA2269 operates over a wide V_{CC} range of 1.65V to 4.3V, 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 FSA2269 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 FSA2269TS 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.

Ordering Information

Part Number	Top Mark	Eco Status	Package Description
FSA2269L10X	HL	RoHS	10-Lead, MicroPak, JEDEC MO-255, 1.6 x 2.1mm
FSA2269UMX	HP	Green	10-Lead, Quad Ultrathin Molded Leadless Package (UMLP), 1.4 x 1.8mm, 0.4 mm pitch
FSA2269TSL10X	HU	RoHS	10-Lead, MicroPak, JEDEC MO-255, 1.6 x 2.1mm
FSA2269TSUMX	HT	Green	10-Lead, Quad Ultrathin Molded Leadless Package(UMLP), 1.4 x 1.8mm, 0.4mm pitch

For Fairchild’s definition of Eco Status, please visit: http://www.fairchildsemi.com/company/green/rohs_green.html.

Analog Symbols

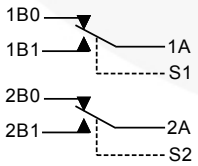


Figure 1. FSA2269

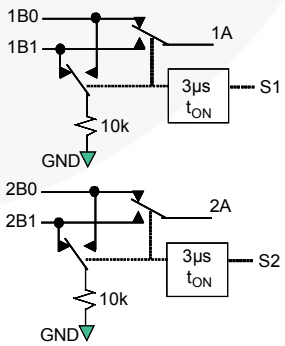


Figure 2. FSA2269TS (with Slow Turn On)

Pin Configuration

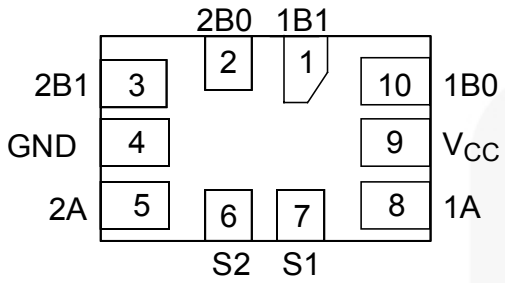


Figure 3. 10-Pin UMLP (Top Through View)

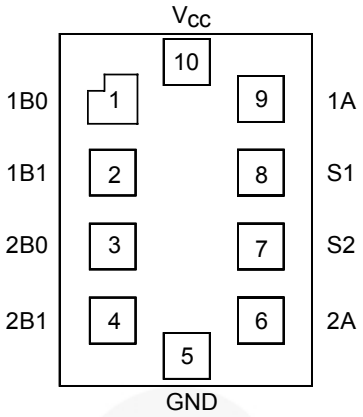


Figure 4. 10-Pin MicroPak™ (Top Through View)

Pin Descriptions

Pin # UMLP	Pin # Micropak	Name	Description
1	2	1B1	Data Ports
2	3	2B0	Data Ports
3	4	2B1	Data Ports
4	5	GND	Ground
5	6	2A	Switch Select Pins
6	7	S2	Switch Select Pins
7	8	S1	Switch Select Pins
8	9	1A	Data Ports
9	10	V_{CC}	Supply Voltage
10	1	1B0	Data Ports

Truth Table

Control Input, Sn	Function
LOW Logic Level	nB0 connected to nA (FSA2269/2269TS); nB1 terminated to GND (FSA2269TS only)
HIGH Logic Level	nB1 connected to nA(FSA2269/2269TS); nB0 terminated to GND (FSA2269TS only)

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. Functional operation above the recommended operating conditions is not implied. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. Absolute maximum ratings are stress ratings only.

Symbol	Parameter			Min.	Max.	Unit
V_{CC}	Supply Voltage			-0.5	5.5	V
V_{SW}	Switch I/O Voltage[1]	1B0, 1B1, 2B0, 2B1, 1A, 2A Pins		V_{CC} -4.6V	V_{CC} +0.3V	V
V_{CNTRL}	Control Input Voltage[1]	S1, S2		-0.5	V_{CC}+0.3V	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	MSL
ESD	Human Body Model (JEDEC: JESD22-A114)		I/O to GND		12	kV
			Power to GND		8	kV
			All Other Pins		7	kV
	Charged Device Model (JEDEC: JESD22-C101)				2	kV

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_{CC}	Supply Voltage	1.65V	4.3	V
$V_{S1, S2}$	Control Input Voltage	0V	V_{CC}	V
V_{SW}	Switch I/O Voltage	V_{CC} -4.6	V_{CC}	V
T_A	Operating Temperature	-40ºC	+85	ºC

DC Electrical Characteristics

All typical values are at 25ºC unless otherwise specified.

Symbol	Parameter	Conditions	V_{CC} (V)	T_A=+25ºC			T_A=-40 to +85ºC		Unit
				Min.	Typ.	Max.	Min.	Max.	
V_{IH}	Input Voltage High		3.60 to 4.30				1.70		
			3.00 to 3.60				1.50		V
			2.70 to 3.00				1.35		
			2.30 to 2.70				1.30		
			1.65 to 1.95				0.90		
V_{IL}	Input Voltage Low		3.60 to 4.30					0.7	V
			2.70 to 3.60					0.5	V
			2.30 to 2.70					0.4	
			1.65 to 1.95					0.4	
I_{IN}	Control Input Leakage (S1,S2)	V_{IN}=0 to V_{CC}	1.65 to 4.30				-0.5	0.5	µA
$I_{NO(0FF)}$, $I_{NC(OFF)}$	Off Leakage Current of Port nB0 and nB1 (FSA2269 only)	nA=0.5V, V_{CC}–0.5V nB0 or nB1=V_{CC}-0.5V, 0.5V, or Floating Figure 6	1.95 to 4.30	-50		50	-250	250	nA
$I_{NC(OFF)}$	Off Leakage Current of Port nB0 and nB1 (FSA2269TS)	nA=0.5V, V_{CC}–0.5V nB0 or nB1=0V or Floating Figure 6	1.95 to 4.30	-2		2	-6	6	µA
$I_{A(ON)}$	On Leakage Current of Port nA	nA=0.5V, V_{CC}–0.5V nB0 or nB1=V_{CC}-0.5V, 0.5V, or Floating Figure 7	1.95 to 4.30	-20		20	-150	150	nA
I_{OFF}	Power-Off Leakage Current (Common Port Only 1A, 2A) (FSA2269)	Common Port (1A, 2A), V_{IN}=0V to 4.3V, V_{CC}=0V nB0, nB1=Floating	0V					±1	µA
	Power-Off Leakage Current (Common Port Only 1A, 2A) (FSA2269TS)	Common Port (1A, 2A), V_{IN}=0V to 4.3V, V_{CC}=0V nB0, nB1=0V or Floating	0V					±45	µA
R_{ON}	Switch On Resistance(2,5)	I_{ON}=100mA, nB0 or nB1=0.7V, 3.6V, 4.3V Figure 5	4.30		0.30				Ω
		I_{ON}=100mA, nB0 or nB1=0.7V, 3.6V, 4.3V Figure 5	3.00		0.40			0.80	
		I_{ON}=100mA, nB0 or nB1=0V, 0.7V, 1.6V, 2.3V, Figure 5	2.30		0.52				
		I_{ON}=100mA, nB0 or nB1=0V, 0.7V, 1.65V Figure 5	1.65		1.00				
ΔR_{ON}	On Resistance Matching Between Channels(3)	I_{ON}=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				

DC Electrical Characteristics (Continued)

All typical values are at 25ºC unless otherwise specified.

Symbol	Parameter	Conditions	V_{CC} (V)	T_A=+25ºC			T_A=-40 to +85ºC		Unit
				Min.	Typ.	Max.	Min.	Max.	
$R_{FLAT(ON)}$	On Resistance Flatness(4)	I_{OUT}=100mA, nB0 or nB1=0V to V_{CC}	4.30					0.25	Ω
			3.00					0.25	
			2.30		0.5				
			1.65		0.6				
R_{TERM}	Internal Termination Resistors(5)				10				kΩ
I_{CC}	Quiescent Supply Current	V_{IN}=0 or V_{CC}, I_{OUT}=0	4.30	-100		100	-500	500	nA
I_{CCT}	Increase in I_{CC} per Input	Input at 2.6V	4.30		3.0			10.0	µA
		Input at 1.8V			7.0			15.0	

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 Vcc, temperature, and voltage.
4. Flatness is defined as the difference between the maximum and minimum value of on resistance (R_{ON}) over the specified range of conditions.
5. Guaranteed by characterization, not production tested.

AC Electrical Characteristics

All typical value are for V_{CC}=3.3V, V_{BUS}=5.0V at 25ºC unless otherwise specified.

Symbol	Parameter	Conditions	V_{CC} (V)	T_A=+25ºC			T_A=-40 to +85°C		Unit	Figure
				Min.	Typ.	Max.	Min.	Max.		
t_{ON}	Turn-On Time FSA2269	nB0 or nB1=1.5V, R_L=50Ω, C_L=35pF	3.60 to 4.30			55	15	60	ns	Figure 8 Figure 9
			2.70 to 3.60			60	15	65		
			2.30 to 2.70			100	15	110		
			1.65 to 1.95		70					
	Turn-On Time FSA2269TS	nB0 or nB1=1.5V, R_L=50Ω, C_L=35pF	3.60 to 4.30			3.5	0.5	4.0	µs	Figure 8 Figure 9
			2.70 to 3.60			4.5	0.5	5.0		
			2.30 to 2.70			6.0	0.5	7.0		
			1.65 to 1.95		8.0					
t_{OFF}	Turn-Off Time FSA2269	nB0 or nB1=1.5V, R_L=50Ω, C_L=35pF	3.60 to 4.30			50	5	55	ns	Figure 8 Figure 9
			2.70 to 3.60			55	5	60		
			2.30 to 2.70			60	5	65		
			1.65 to 1.95		40					
	Turn-Off Time FSA2269TS	nB0 or nB1=1.5V, R_L=50Ω, C_L=35pF	3.60 to 4.30			45	5	50	ns	Figure 8 Figure 9
			2.70 to 3.60			50	5	55		
			2.30 to 2.70			55	5	60		
			1.65 to 1.95		50					
t_{BBM}	Break-Before-Make Time FSA2269	nB0 or nB1=1.5V, R_L=50Ω, C_L=35pF	3.60 to 4.30		3		1		ns	Figure 10
			2.70 to 3.60		5		2			
			2.30 to 2.70		10		2			
			1.65 to 1.95		5		2			
t_{BBM}	Break-Before-Make Time FSA2269TS	nB0 or nB1=1.5V, R_L=50Ω, C_L=35pF	3.60 to 4.30		1.5		1.0		ns	Figure 10
			2.70 to 3.60		3.0		1.5			
			2.30 to 2.70		4.0		2.5			
			1.65 to 1.95		5.0		3.0			
Q	Charge Injection	C_L=1.0nF, V_S=0V, R_S=0Ω	1.65 to 4.30		25				pC	Figure 14
OIRR	Off Isolation	f=100kHz, R_L=50Ω, C_L=0pF	1.65 to 4.30		-70				dB	Figure 12
Xtalk	Crosstalk	f=100kHz, R_L=50Ω, C_L=0pF	1.65 to 4.30		-70				dB	Figure 13
BW	-3db Bandwidth	R_L=50Ω, C_L=0pF	1.65 to 4.30		>50				MHz	Figure 11
THD	Total Harmonic Distortion	f=20Hz to 20kHz, R_L=32Ω, V_{IN}=2V_{pp} V_{BIAS}=0V	1.65 to 4.30		.06				%	Figure 17

Capacitance

Symbol	Parameter	Conditions	V_{CC} (V)	T_A=+25ºC			Unit	Figure
				Min.	Typ.	Max.		
C_{IN}	Control Pin Input Capacitance	f=1MHz	0		2.5		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

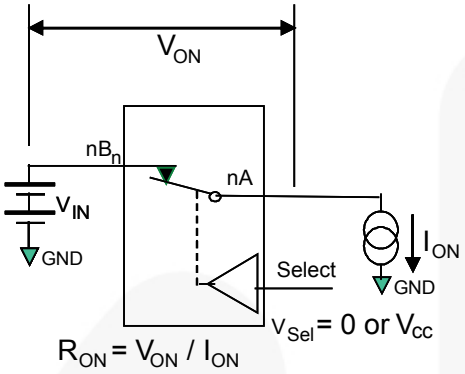
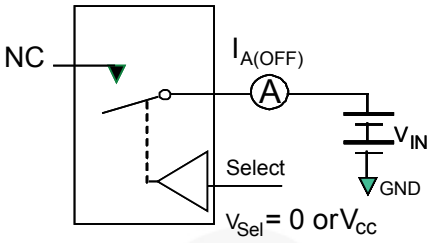


Figure 5. On Resistance



**Each switch port is tested separately.

Figure 6. Off Leakage

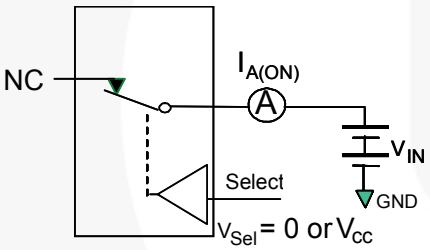
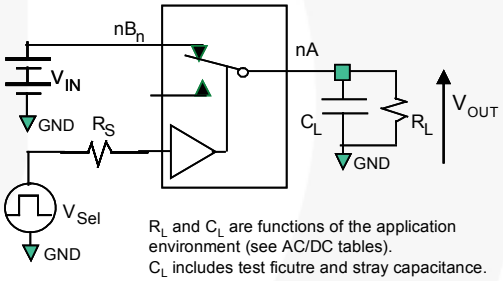


Figure 7. On Leakage



R_L and C_L are functions of the application environment (see AC/DC tables).
C_L includes test ficutre and stray capacitance.

Figure 8. Test Circuit Load

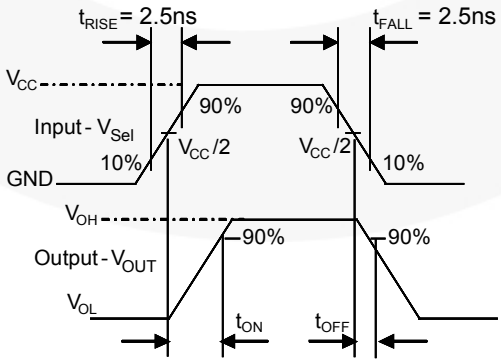
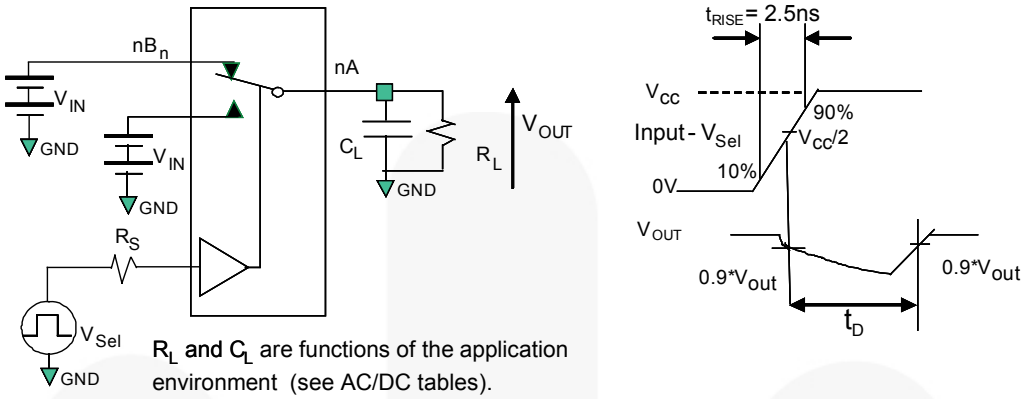


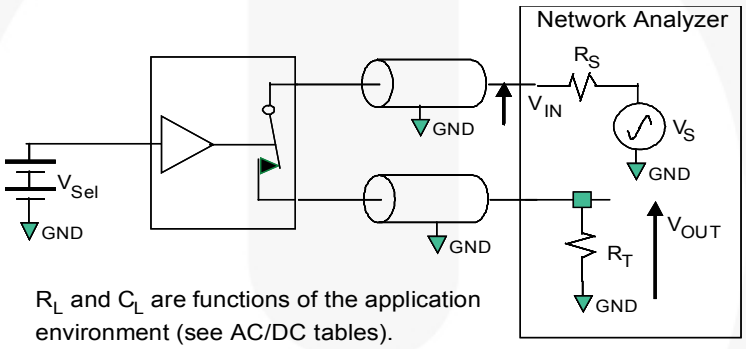
Figure 9. Turn-On / Turn-Off Waveforms

Test Diagrams (Continued)



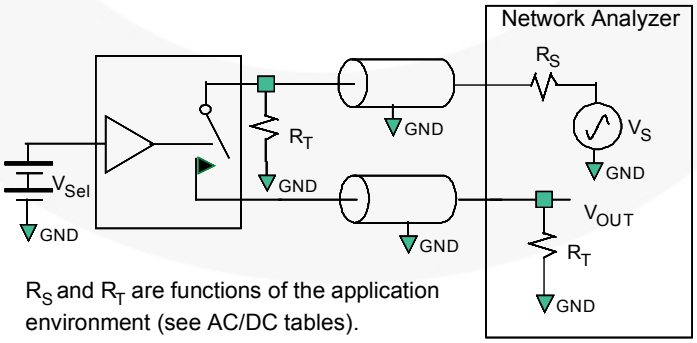
R_L and C_L are functions of the application environment (see AC/DC tables).
C_L includes test fixture and stray capacitance.

Figure 10. Break-Before-Make Interval Timing



R_L and C_L are functions of the application environment (see AC/DC tables).
C_L includes test fixture and stray capacitance.

Figure 11. Bandwidth

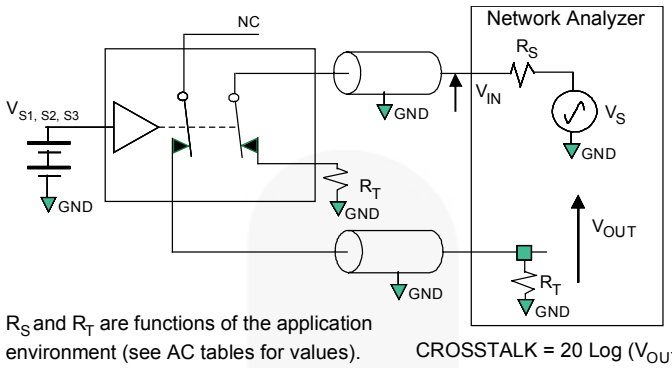


R_S and R_T are functions of the application environment (see AC/DC tables).

Off-Isolation = 20 Log (V_{OUT} / V_{IN})

Figure 12. Channel Off Isolation

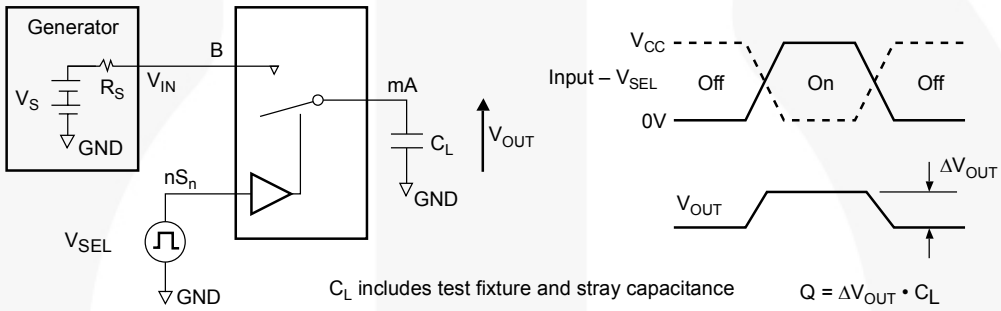
Test Diagrams (Continued)



R_S and R_T are functions of the application environment (see AC tables for values).

CROSSTALK = 20 Log (V_{OUT}/ V_{IN})

Figure 13. Adjacent Channel Crosstalk



C_L includes test fixture and stray capacitance

$Q = \Delta V_{OUT} \cdot C_L$

Figure 14. Charge Injection Test

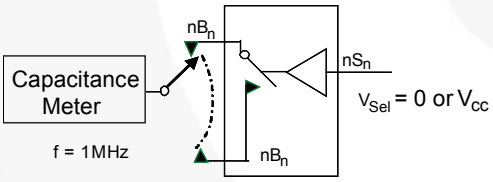


Figure 15. Channel Off Capacitance

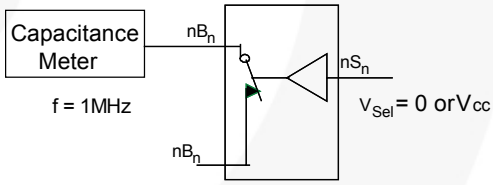
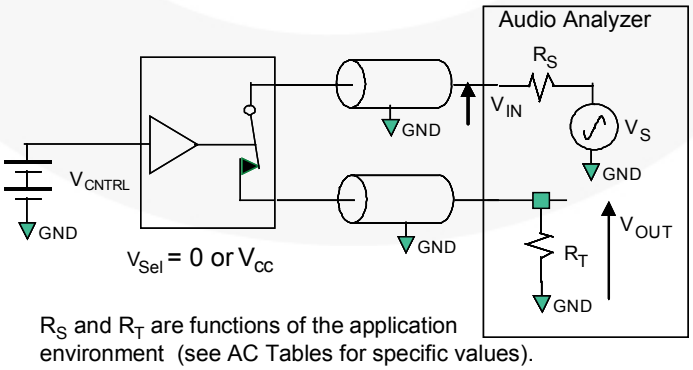


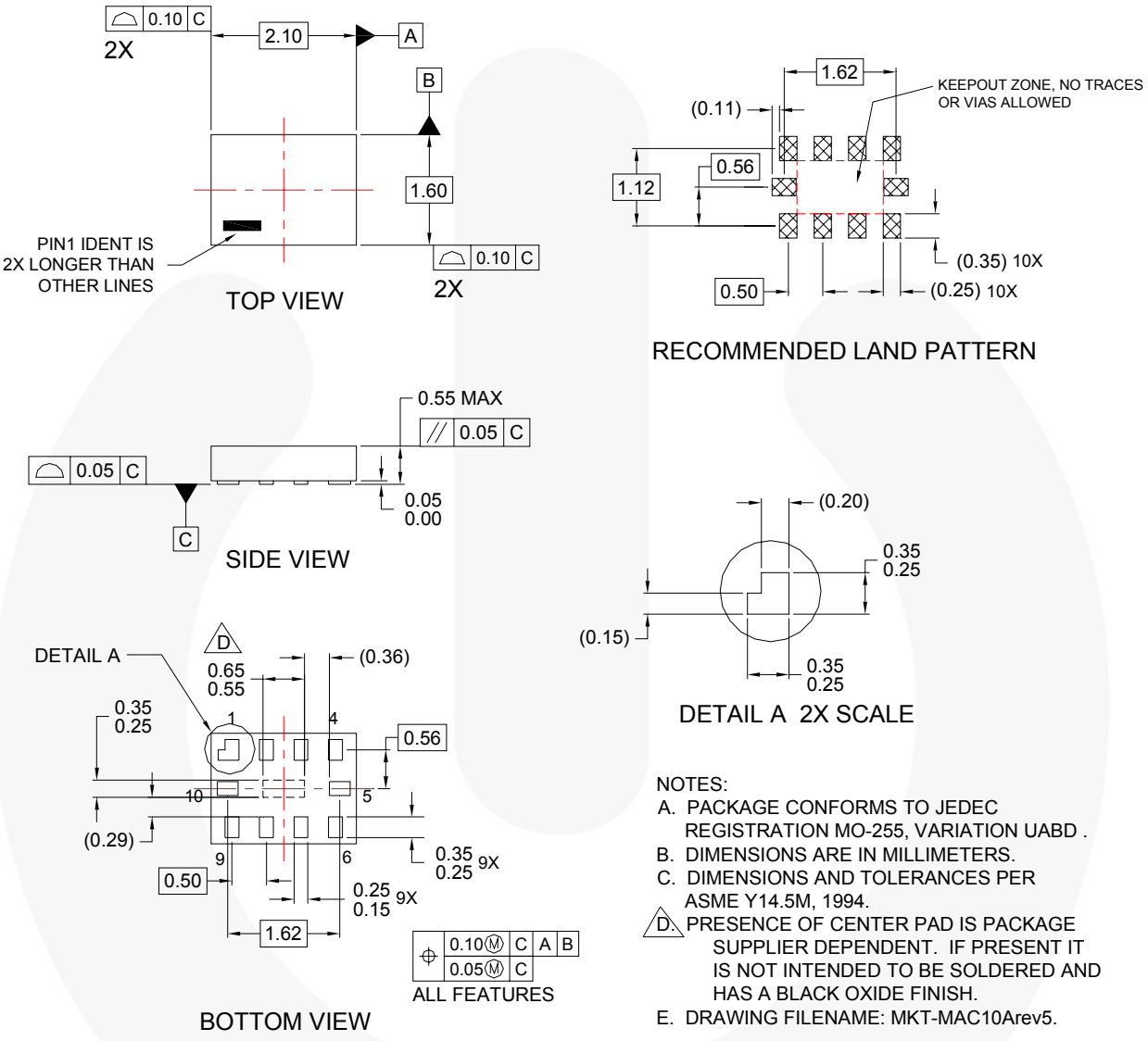
Figure 16. Channel On Capacitance



R_S and R_T are functions of the application environment (see AC Tables for specific values).

Figure 17. Total Harmonic Distortion

Physical Dimensions



NOTES:

A. PACKAGE CONFORMS TO JEDEC REGISTRATION MO-255, VARIATION UABD .

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.

D. PRESENCE OF CENTER PAD IS PACKAGE SUPPLIER DEPENDENT. IF PRESENT IT IS NOT INTENDED TO BE SOLDERED AND HAS A BLACK OXIDE FINISH.

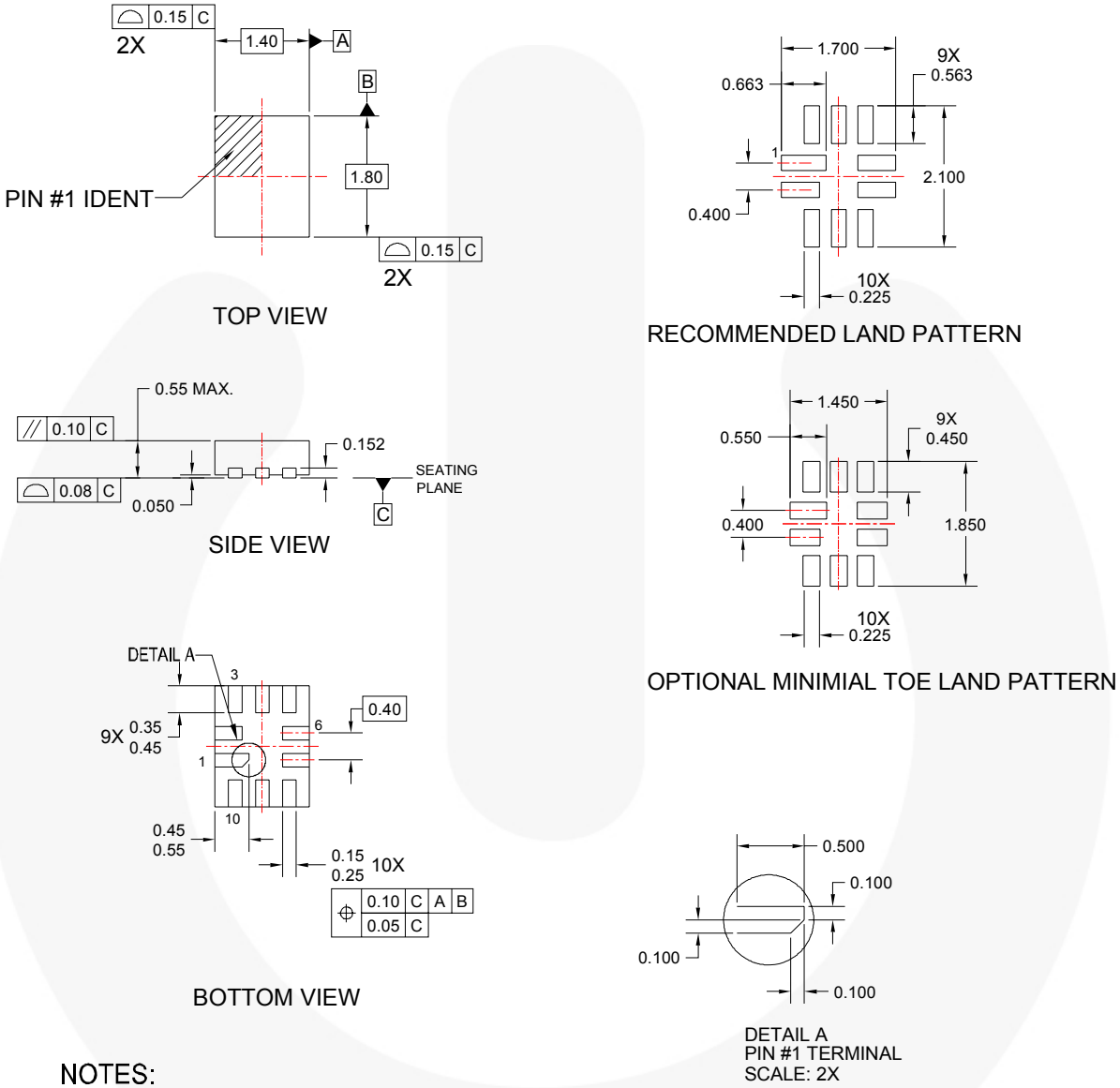
E. DRAWING FILENAME: MKT-MAC10Arev5.

Figure 18. 10-Lead MicroPak™

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/.

Physical Dimensions



NOTES:

A. DIMENSIONS ARE IN MILLIMETERS.

B. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994

C. DRAWING FILENAME: UMLP10Arev2

Figure 19. 10-Lead, Quad Ultrathin Molded Leadless Package (UMLP)

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http://www.fairchildsemi.com/packaging/.

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CorePOWER™
CROSSVOLT™
CTL™
Current Transfer Logic™
EcoSPARK®
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EZSWITCH™*
EZ™*
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Fairchild Semiconductor®
FACT Quiet Series™
FACT®
FAST®
FastvCore™
FETBench™
FlashWriter®*
FPS™
F-PFS™
FRFET®
Global Power Resource℠
Green FPS™
Green FPS™ e-Series™
Gmax™
GTO™
IntelliMAX™
ISOPLANAR™
MegaBuck™
MICROCOUPLER™
MicroFET™
MicroPak™
MillerDrive™
MotionMax™
Motion-SPM™
OPTOLOGIC®
OPTOPLANAR®
®
PDP SPM™
Power-SPM™
PowerTrench®
PowerXS™
Programmable Active Droop™
QFET®
QS™
Quiet Series™
RapidConfigure™
™
Saving our world, 1mW/W/kW at a time™
SignalWise™
SmartMax™
SMART START™
SPM®
STEALTH™
SuperFET™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
SupreMOS™
SyncFET™
Sync-Lock™
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Definition of Terms

Datasheet Identification	Product Status	Definition
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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.
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