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April 2014

# **FSA1259A**

# Low-Voltage, 1 $\Omega$ Dual SPST Analog Switch with Power-Off Isolation

### **Features**

- Power-Off Isolation (V<sub>CC</sub>=0 V)
- 1 Ω On Resistance (R<sub>ON</sub>) for 4.5V V<sub>CC</sub>
- 0.25 Ω Maximum R<sub>ON</sub> Flatness for 4.5 V V<sub>CC</sub>
- Space-Saving, US8 Surface Mount Package
- Broad V<sub>CC</sub> Operating Range: 1.65 V to 5.50 V
- Fast Turn-On and Turn-Off Times
- Break-Before-Make Enable Circuitry

### **Applications**

- Cellular Phone
- Portable Media Player
- PDA

# Description

The FSA1259A is a high-performance, dual, Single-Pole / Single-Throw (SPST) analog switch. The device features ultra-low  $R_{ON}$  of 1  $\Omega$  at 4.5 V  $V_{CC}$  and operates over the wide  $V_{CC}$  range of 1.65 V to 5.50 V.

The FS1259A allows for reduced input thresholds on the select pins.

The device is fabricated with sub-micron CMOS technology to achieve fast switching speeds and is designed for break-before-make operation.

# **Ordering Information**

Part Number	Top Mark	Operating Temperature Range	Package	Packing Method
FSA1259AK8X	59A	-40°C to +85°C	8-Lead US8, JEDEC MO-187, Variation CA, 3.0 mm Wide	3000 Units Tape and Reel

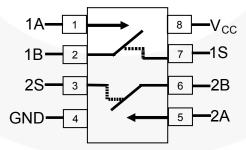


Figure 1. Analog Symbols

# **Pin Assignments**

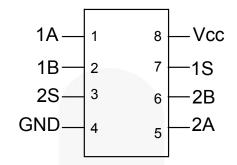


Figure 2. Pin Assignments (Top View)

# **Pin Definitions**

Pin#	Name	Description
1	1A	Data Port
2	1B	Data Port
3	2S	Control Input
4	GND	Ground
5	2A	Data Port
6	2B	Data Port
7	1S	Control Input
8	V <sub>CC</sub>	Supply Voltage

# **Truth Table**

Control Input (S)	Function
LOW	Disconnected
HIGH	A Connected to B

### **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	7.0	V
V <sub>SW</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	6.5	V
I <sub>IK</sub>	Input Diode Current		-50	mA
I <sub>SW</sub>	Switch Current (Continuous)		200	mA
I <sub>SWPEAK</sub>	Peak Switch Current (Pulsed at 1 ms Duration, <10% Duty Cycle)		400	mA
P <sub>D</sub>	Power Dissipation at 85°C		3.0	μW
T <sub>STG</sub>	Storage Temperature Range	-65	+150	°C
TJ	Maximum Junction Temperature		+150	°C
TL	Lead Temperature (Soldering, 10 seconds)		+260	°C
	Human Body Model (JEDEC: JESD22-A114)		8000	V
ESD	Charged Device Model (JEDEC: JESD22-C101)		2000	V
	Machine Model (JEDEC: JESD22-A115)		350	V

### Note:

1. The input and output negative ratings may be exceeded if the 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	1.65	5.50	V
A <sub>SEL</sub>	Control Input Voltage <sup>(2)</sup>	0	V <sub>CC</sub>	V
$V_{SW}$	Switch Input Voltage	0	V <sub>CC</sub>	V
T <sub>A</sub>	Operating Temperature	-40	+85	°C
$\theta_{JA}$	Thermal Resistance, Still Air		215	°C/W

### Note:

2. Control Input must be held HIGH or LOW; it must not float.

### **Electrical Characteristics**

All typical values are at 25°C unless otherwise specified.

Cumbal	Doromotor	V 00	Conditions	T <sub>A</sub> =+25°C			T <sub>A</sub> =-40	Unit	
Symbol	Parameter	V <sub>cc</sub> (V)	Conditions	Min.	Тур.	Max.	Min.	Max.	Unit
		4.50 to 5.50					1.0		
$V_{IH}$	Input Voltage High	3.00 to 3.60					1.0		V
VIH	iliput voltage riigii	2.30 to 2.70					0.95		V
		1.65 to 1.95					0.95		
		4.50 to 5.50						0.75	
$V_{IL}$	Input Voltage Low	3.00 to 3.60						0.65	V
VIL	input voltage Low	2.30 to 2.70						0.55	V
		1.65 to 1.95						0.5	
		5.50	V <sub>IN</sub> =0 or V <sub>CC</sub>	-10		10	-50	50	
	Control Input	3.60	V <sub>IN</sub> =0 or V <sub>CC</sub>	-2		2	-20	20	nA
I <sub>IN</sub>	Leakage	2.70	V <sub>IN</sub> =0 or V <sub>CC</sub>	-2		2	-20	20	IIA
/		1.95	V <sub>IN</sub> =0 or V <sub>CC</sub>	-2	$A_{i}$	2	-20	20	
		5.50	A=1 V, B=4.5V or B=4.5 V, A= 1V	-10		10	-50	50	
Off-Leakage		3.60	A=1 V, B=3.0 V or B=3.0 V, A=1 V	-5		5	-50	50	nA
NO(0FF)	Current	2.70	A=0.5 V, B=2.3 V or B=2.3, A=0.5 V	-5		5	-50	50	ПА
		1.95	A=0.3 V, B=1.65 V or B=1.65, A=0.3 V	-5		5	-50	50	
		5.50	A=Floating; B=4.5 V, 1 V	-5		5	-50	50	
	On-Leakage	3.60	A=Floating; B=3.0 V, 1 V	-2		2	-20	20	
I <sub>NO(On)</sub>	Current of Port B	2.70	A=Floating; B=2.3 V, 0.5 V	-2		2	-20	20	nA
		1.95	A=Floating; B=1.65 V, 0.3 V	-2		2	-20	20	
		5.50	A=1 V, 4.5 V; B=Floating	-5		5	-50	50	
I <sub>A(ON)</sub> On-Leakage Current of Port A	3.60	A=1 V, 3.0 V; B=Floating	-2		2	-20	20	nA	
		2.70	A=0.5 V, 2.3; B=Floating	-2		2	-20	20	IIA
		1.95	A=0.3 V, 1.65 V; B=Floating	-2		2	-20	20	
I <sub>OFF</sub>	Power Off Leakage Current of Port A & Port B	0	A=0 to 5.5 V; B=0 to 5.5 V	-1		1	-10	10	μА

# **Electrical Characteristics** (Continued)

All typical values are at 25°C unless otherwise specified.

Symbol	Parameter	Parameter V <sub>cc</sub> (V)	Conditions		T <sub>A</sub> =+25°C			T <sub>A</sub> =-40 to +85°C		
•		360 (1)		Min.	Тур.	Max.	Min.	Max.		
		4.50	I <sub>OUT</sub> =-100 mA, 1B or 2B=0 to V <sub>CC</sub>		0.8	1.0		1.2		
	Peak On	3.00	I <sub>OUT</sub> =-100 mA, 1B or 2B=0 to V <sub>CC</sub>		1.0	1.5		1.8		
$R_{PEAK}$	Resistance	2.30	I <sub>OUT</sub> =-8 mA, 1B or 2B=0 to V <sub>CC</sub>		1.5	2.0		2.5	Ω	
		1.65	I <sub>OUT</sub> =-2 mA, 1B or 2B=0		5.0	12.0		15.0		
			to V <sub>CC</sub> T <sub>A</sub> =-40°C		20.0					
		4.50	I <sub>OUT</sub> =-100 mA, 1B or 2B=2.5 V		0.70	0.85		1.00		
D	Switch On	3.00	I <sub>OUT</sub> =-100 mA, 1B or 2B=2.0 V		0.9	1.3		1.6	Ω	
Ron	Resistance <sup>(3)</sup>	2.30	I <sub>OUT</sub> =-8 mA, 1B or 2B=1.8V		1.4	2.0		2.4	Ω	
	4	1.65	I <sub>OUT</sub> =-2 mA, 1B or 2B=1.5 V		2.0	2.5		3.5		
		4.50	I <sub>OUT</sub> =-100 mA, 1B or 2B=2.5 V		0.05	0.10		0.10		
1	On Resistance	3.00	I <sub>OUT</sub> =-100 mA, 1B or 2B=2.0 V		0.10	0.15		0.15		
ΔR <sub>ON</sub>	$\Delta R_{\text{ON}}$ Matching Between Channels <sup>(4)</sup>	2.30	I=-8 mA, 1B or 2B=1.8 V		0.15	0.20		0.20	Ω	
		1.65	I <sub>OUT</sub> =-2 mA 1B or 2B=1.5 V		0.15	0.40		0.40		
		4.50	I <sub>OUT</sub> =-100 mA, 1B or 2B=1.0 V, 1.5 V, 2.5 V		0.10	0.25		0.25		
D	On Resistance	3.00	I <sub>OUT</sub> =-100 mA, 1B or 2B=0.8 V, 2.0 V		0.1	0.3		0.3		
R <sub>FLAT(ON)</sub> Flatness <sup>(5)</sup>	2.30	I <sub>OUT</sub> =-8 mA, 1B or 2B=0.8 V, 1.8 V		0.2	1.0		1.0	Ω		
		1.65	I <sub>OUT</sub> =-2 mA, 1B or 2B=0.6 V, 1.5 V		1.5			y -		
		5.50	V <sub>IN</sub> =0 or V <sub>CC</sub> , I <sub>OUT</sub> =0		5	50		500		
	Quiescent Supply	3.60	V <sub>IN</sub> =0 or V <sub>CC</sub> , I <sub>OUT</sub> =0		1	25		300	nA	
I <sub>CC</sub>	Current	2.70	V <sub>IN</sub> =0 or V <sub>CC</sub> , I <sub>OUT</sub> =0		1	20		250		
		1.95	V <sub>IN</sub> =0 or V <sub>CC</sub> , I <sub>OUT</sub> =0		1	15		150		
I <sub>CCT</sub>	Increase in I <sub>CC</sub> per Control Input	4.5 to 5.5	Asel=1.8 V		25			40	μΑ	

- On resistance is determined by the voltage drop between the A and B pins at the indicated current through
- ΔR<sub>ON</sub>=R<sub>ON</sub> maximum R<sub>ON</sub> minimum; 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.

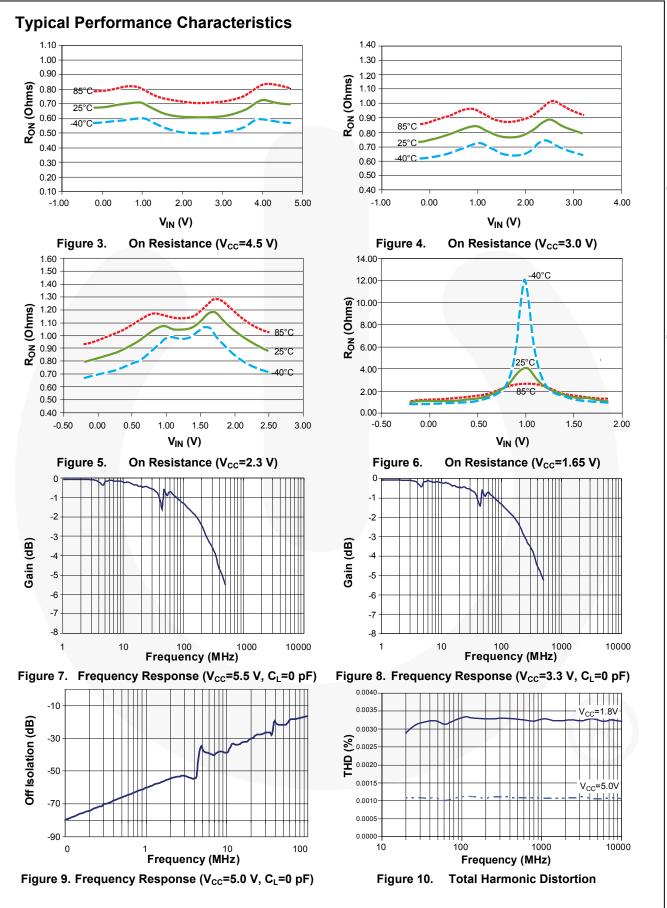
### **AC Electrical Characteristics**

All typical values are at  $V_{CC}$ =1.8 V, 2.5 V, 3.0 V, 5.0 V at 25°C unless otherwise specified.

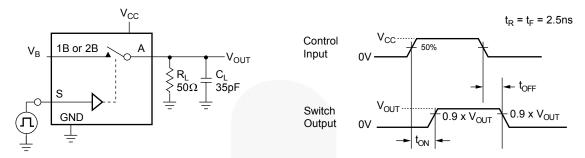
Symbol Parameter		V <sub>cc</sub> (V)	Conditions	T <sub>A</sub> =+25°C			40 to 5°C	Unit	Figure	
1				Min.	Тур.	Max.	Min.	Max.		
		4.50 to 5.50		1.0	4.0	7.5	1.0	9.0		
	T 0 T	3.00 to 3.60	1B or 2 B=V <sub>CC</sub> ,	1.5	6.0	9.5	1.0	10.0		F: 44
t <sub>ON</sub>	Turn-On Time	2.30 to 2.70	$R_L$ =50 Ω, $C_L$ =35 pF	2.0	8.0	10.0	1.0	12.0	ns	Figure 11
		1.65 to 1.95		3.0	14.0	18.0	1.0	20.0		
		4.50 to 5.50		4.5	13.0	17.0	3.5	20.0		
	T 0"T	3.00 to 3.60	1B or 2B=V <sub>CC</sub> ,	4.5	13.5	17.0	3.0	20.0		F: 44
t <sub>OFF</sub>	Turn-Off Time	2.30 to 2.70	$R_L$ =50 $\Omega$ , $C_L$ =35 pF	4.5	16.0	20.0	3.0	23.0	ns	Figure 11
		1.65 to 1.95		5.0	24.0	33.0	4.0	36.0		
		4.50 to 5.50			15					
	Observation	3.00 to 3.60	C <sub>L</sub> =1.0 nF,		11				pC	Figure 13
Q	Charge Injection	2.30 to 2.70	$V_{GEN}$ =0 V, R <sub>GEN</sub> =0 $\Omega$		8					
		1.65 to 1.95			6					
OIRR	Off-Isolation	1.8 to 5.0	f=1 MHz, R <sub>L</sub> =50 Ω		-60				dB	Figure 12
Xtalk	Crosstalk	1.8 to 5.0	f=1 MHz, R <sub>L</sub> =50 Ω		-73				dB	Figure 12
		4.50 to 5.50			240					
DW	BW -3 db Bandwidth	3.00 to 3.60	D =50 O		240				l MII-	Figure 15
DVV		2.30 to 2.70	R <sub>L</sub> =50 Ω		240				MHz	Figure 15
		1.65 to 1.95			240					
THD	Total Harmonic	1.8	R <sub>L</sub> =600 Ω, V <sub>IN</sub> =0.5 V <sub>PP</sub> ,		.003				%	Figure 16
וווט	Distortion	5.0	f=20 Hz to 20 kHz		.001				70	Figure 16

# Capacitance

Cumbal	Davamatav	V 00	Conditions	A	11			
Symbol	Parameter	V <sub>cc</sub> (V)	Conditions	Min.	Тур.	Max.	Unit	
C <sub>IN</sub>	Control Pin Input Capacitance	0	f=1 MHz Figure 14		3		pF	
C <sub>OFF</sub>	B Port Off Capacitance	1.65 to 5.50	f=1 MHz Figure 14		21		pF	
Con	A Port On Capacitance	1.65 to 5.50	f=1 MHz Figure 14		47	1	pF	



# **Test Diagrams**



C<sub>L</sub> includes fixture and stray capacitance.

Logic input waveforms inverted for switches that have the opposite logic sense.

Figure 11. Turn On / Off Timing

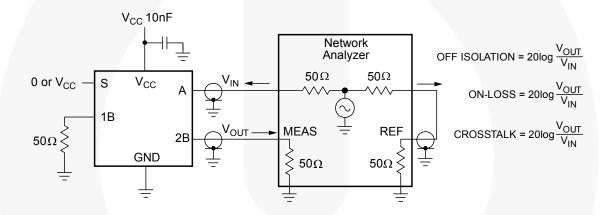


Figure 12. Off Isolation and Crosstalk

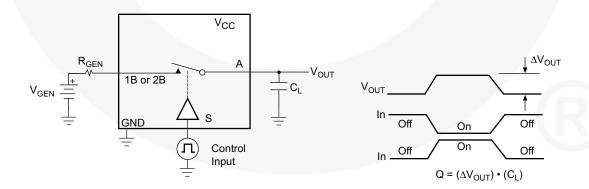


Figure 13. Charge Injection

# Test Diagrams (Continued)

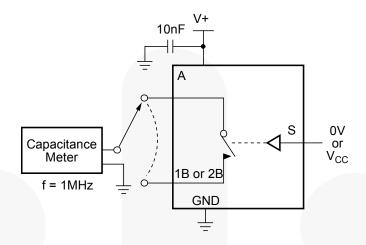


Figure 14. On / Off Capacitance Measurement Setup

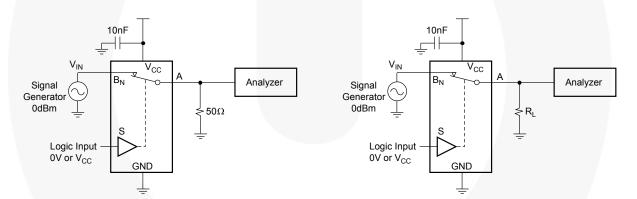
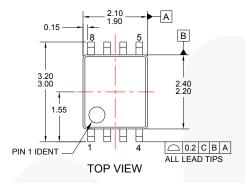
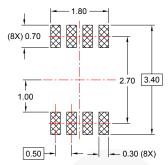


Figure 15. Bandwidth

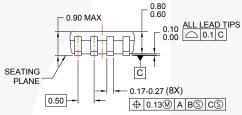
Figure 16. Harmonic Distortion

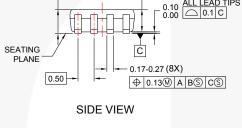
# **Physical Dimensions**





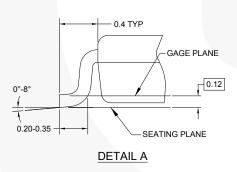
RECOMMENDED LAND PATTERN





# NOTES:

- A CONFORMS TO JEDEC REGISTRATION MO-187
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1994.
- E. FILE DRAWING NAME: MKT-MAB08Arev4



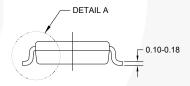


Figure 17. 8-Lead US8, JEDEC MO-187, Variation CA, 3.0 mm Wide Package

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### Definition of Terms

Datasheet Identification	Product Status	<b>Definition</b> Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.				
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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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