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FSA1259A Low-Voltage, 1 Ω Dual SPST Analog Switch with Power-Off Isolation

Features

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

V V_{cc}

Description

The FSA1259A is a high-performance, dual, Single-Pole / Single-Throw (SPST) analog switch. The device features ultra-low R_{ON} of 1 Ω 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.

Applications

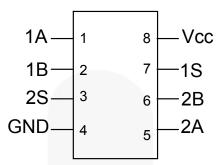
- Cellular Phone
- Portable Media Player
- PDA

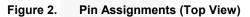
Ordering Information

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
		1A - 1 $1B - 2$ $2S - 3$ $GND - 4$ $GND - 4$	→ <u>5</u> <u>−</u> 2A	
		Figure 1.	Analog Symbols	

April 2014

Pin Assignments





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 _{CC}	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 _{cc}	Supply Voltage	-0.5	7.0	V
V _{SW}	Switch Voltage ⁽¹⁾	-0.5	V _{CC} +-0.5	V
V _{IN}	Input Voltage ⁽¹⁾	-0.5	6.5	V
I _{IK}	Input Diode Current		-50	mA
I _{SW}	Switch Current (Continuous)		200	mA
I _{SWPEAK}	Peak Switch Current (Pulsed at 1 ms Duration, <10% Duty Cycle)		400	mA
P _D	Power Dissipation at 85°C		3.0	μW
T _{STG}	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 _{SEL}	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, Still Air		215	°C/W

Note:

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

	Г	م <mark>=+25</mark> °	C	T _A =-40 t	to +85°C	11			
nditions	Min.	Тур.	Max.	Min.	Max.	Unit			
				1.0					
				1.0		V			
				0.95		v			
				0.95					
					0.75				
					0.65	V			
					0.55				
	40		40	50	0.5				
;	-10		10	-50	50 20				
:	-2		2	-20	20	nA			
:	-2 -2		2	-20 -20	20 20				
5V or 1V	-10		10	-50	50				
0 V or 1 V	-5		5	-50	50	nA			
2.3 V or 5 V	-5		5	-50	50				
1.65 V or).3 V	-5		5	-50	50				
B=4.5 V, 1 V	-5		5	-50	50				
B=3.0 V, 1 V	-2		2	-20	20	nA			
B=2.3 V, 0.5 V	-2		2	-20	20	ΠA			
B=1.65 V, 0.3 V	-2		2	-20	20				
/; B=Floating	-5		5	-50	50				
/; B=Floating	-2		2	-20	20	nA			
; B=Floating	-2		2	-20	20				
5 V; B=Floating	-2		2	-20	20				
/; B=0 to 5.5 V	-1		1	-10	10	μA			

Electrical Characteristics

All typical values are at 25°C unless otherwise specifie

Oursels a l	Demosrater	V AA	Conditions	٦	۲ _A =+25°	С	T _A =-40	to +85°C	11 ! 4
Symbol	Parameter	V _{cc} (V)	V _{cc} (V) Conditions		Тур.	Max.	Min.	Max.	Unit
		4.50 to 5.50					1.0		
		3.00 to 3.60					1.0		V
V _{IH}	Input Voltage High	2.30 to 2.70					0.95		V
		1.65 to 1.95					0.95		
		4.50 to 5.50						0.75	
V	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 _{IN} =0 or V _{CC}	-10		10	-50	50	
	Control Input	3.60	V _{IN} =0 or V _{CC}	-2		2	-20	20	~ ^
I _{IN}	Leakage	2.70	V _{IN} =0 or V _{CC}	-2		2	-20	20	nA
		1.95	V_{IN} =0 or V_{CC}	-2		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
INO(OFF) Current	2.70	A=0.5 V, B=2.3 V or B=2.3, A=0.5 V	-5		5	-50	50		
		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 _{NO(On)}	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	
	On-Leakage	3.60	A=1 V, 3.0 V; B=Floating	-2		2	-20	20	~^
I _{A(ON)} Current of Port A	2.70	A=0.5 V, 2.3; B=Floating	-2		2	-20	20	nA	
		1.95	A=0.3 V, 1.65 V; B=Floating	-2		2	-20	20	
I _{OFF}	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	μA

Electrical Characteristics (Continued)

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

Symbol Parameter		Parameter V _{cc} (V) Conditions		T	₄=+25°C	T _A =-40 to +85°C		Unit		
e jiii.eei					Min.	Тур.	Max.	Min.	Max.	
		4.50	I _{OUT} =-100 mA 1B or 2B=0 to			0.8	1.0		1.2	
		3.00	I _{OUT} =-100 mA 1B or 2B=0 to			1.0	1.5		1.8	1
R_{PEAK}	Peak On Resistance	2.30	I _{OUT} =-8 mA, 1B or 2B=0 to	v V _{cc}		1.5	2.0		2.5	Ω
		1 65	I _{OUT} =-2 mA,	T _A =25, 85°C		5.0	12.0		15.0	1
		1.65	1B or 2B=0 to V _{CC}	T _A =-40°C		20.0	-			-
		4.50	I _{OUT} =-100 mA 1B or 2B=2.5			0.70	0.85		1.00	
_	Switch On	3.00	I _{OUT} =-100 mA 1B or 2B=2.0			0.9	1.3		1.6	
R _{on}	Resistance ⁽³⁾	2.30	I _{OUT} =-8 mA, 1B or 2B=1.8	I _{OUT} =-8 mA,		1.4	2.0		2.4	Ω
		1.65	I _{OUT} =-2 mA, 1B or 2B=1.5 V			2.0	2.5		3.5	
	On Resistance	4.50	I _{OUT} =-100 mA 1B or 2B=2.5			0.05	0.10		0.10	
		3.00	I _{OUT} =-100 mA 1B or 2B=2.0			0.10	0.15		0.15	
ΔR_{ON}	Matching Between Channels ⁽⁴⁾	2.30	I=-8 mA, 1B or 2B=1.8	v		0.15	0.20		0.20	Ω
		1.65	I _{OUT} =-2 mA 1B or 2B=1.5	v		0.15	0.40		0.40	
		4.50	I _{OUT} =-100 mA 2B=1.0 V, 1.5			0.10	0.25		0.25	
	On Resistance	3.00	I _{OUT} =-100 mA 1B or 2B=0.8			0.1	0.3		0.3	
R _{FLAT(ON)}	Flatness ⁽⁵⁾	2.30	I _{OUT} =-8 mA, 1B or 2B=0.8	V, 1.8 V		0.2	1.0		1.0	Ω
			I _{OUT} =-2 mA, 1B or 2B=0.6	V, 1.5 V		1.5				1
		5.50	V_{IN} =0 or V_{CC} ,	I _{OUT} =0		5	50		500	
	Quiescent Supply	3.60	V_{IN} =0 or V_{CC} ,	I _{OUT} =0		1	25		300	1
I _{cc}	Current	2.70	V_{IN} =0 or V_{CC} ,	I _{OUT} =0		1	20		250	nA
		1.95	V_{IN} =0 or V_{CC} ,	I _{OUT} =0		1	15		150	
I _{CCT}	Increase in I _{cc} per Control Input	4.5 to 5.5	Asel=1.8 V			25			40	μA

Notes:

On resistance is determined by the voltage drop between the A and B pins at the indicated current through 3. the switch.

4.

 $\Delta R_{ON} = R_{ON}$ maximum – R_{ON} minimum; 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 5. specified range of conditions.

FSA1259A — Low-Voltage, 1 Ω SPST Analog Switch with Power-Off Isolation

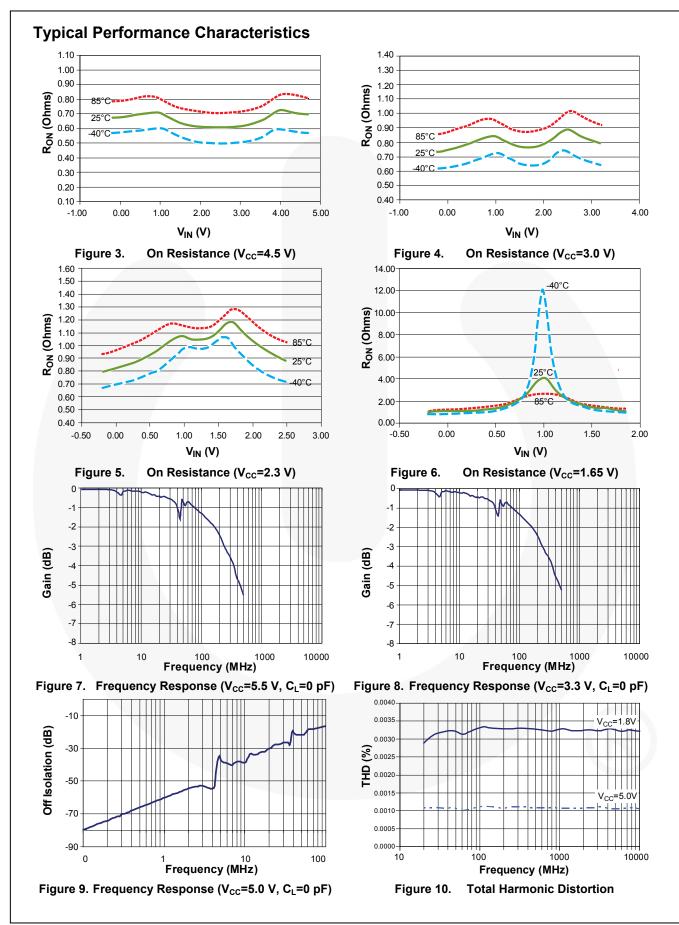
AC Electrical Characteristics

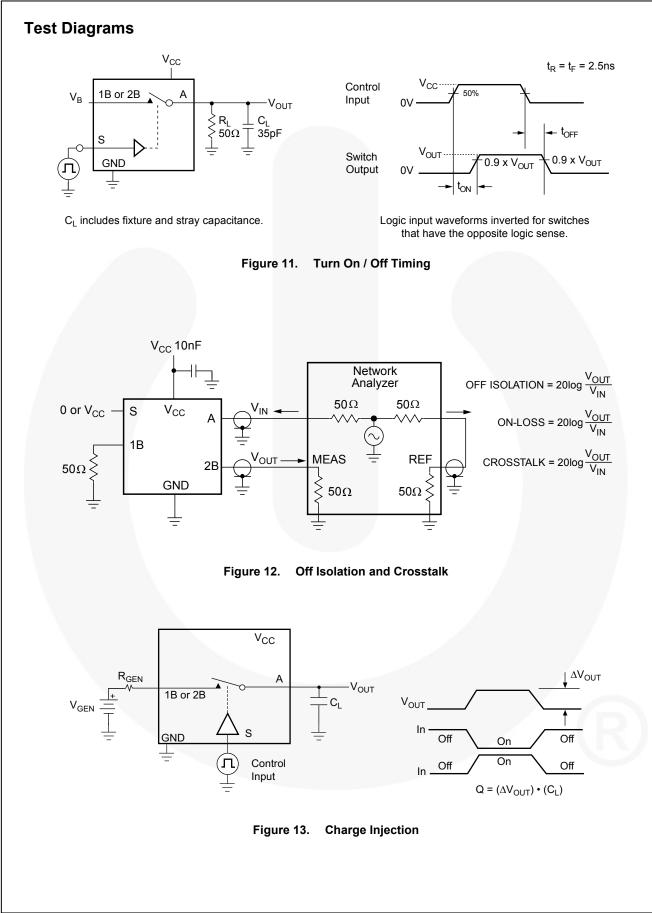
All typical values are at V_{CC}=1.8 V, 2.5 V, 3.0 V, 5.0 V at 25°C unless otherwise specified.

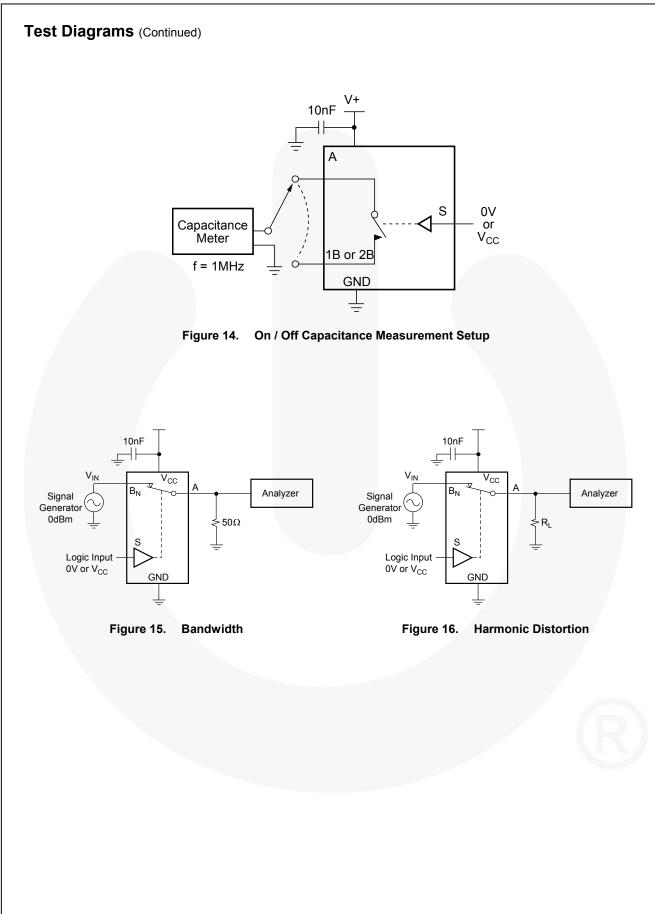
Symbol	Parameter	V _{cc} (V)	Conditions	Conditions			-40 to 5°C	Unit	Figure		
5				Min.	Тур.	Max.	Min.	Max.		Ū	
		4.50 to 5.50		1.0	4.0	7.5	1.0	9.0			
	T O T	3.00 to 3.60	1B or 2 B=V _{CC} ,	1.5	6.0	9.5	1.0	10.0			
t _{on}	Turn-On Time	2.30 to 2.70	R _L =50 Ω, C _L =35 pF	2.0	8.0	10.0	1.0	12.0	ns	Figure 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			
		3.00 to 3.60	1B or 2B=V _{CC} , R _L =50 Ω, C _L =35 pF	4.5	13.5	17.0	3.0	20.0		-	
t _{OFF}	Turn-Off Time	2.30 to 2.70		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					Figure 13	
0	Ob anna hais atian	3.00 to 3.60	C _L =1.0 nF,		11				pC		
Q	Charge Injection	2.30 to 2.70	·V _{GEN} =0 V, R _{GEN} =0 Ω		8						
		1.65 to 1.95			6						
OIRR	Off-Isolation	1.8 to 5.0	f=1 MHz, R _L =50 Ω		-60				dB	Figure 12	
Xtalk	Crosstalk	1.8 to 5.0	f=1 MHz, R _L =50 Ω		-73				dB	Figure 12	
		4.50 to 5.50			240						
BW	-3 db Bandwidth	3.00 to 3.60	R ₁ =50 Ω		240				MHz	Eiguro 15	
DVV	-3 00 Bandwidth 2	2.30 to 2.70	RL-30 12		240				IVITZ	Figure 15	
		1.65 to 1.95			240						
THD	Total Harmonic	1.8	R _L =600 Ω, V _{IN} =0.5 V _{PP} ,		.003				%	Figure 16	
	Distortion	5.0	f=20 Hz to 20 kHz		.001				70	Figure 16	

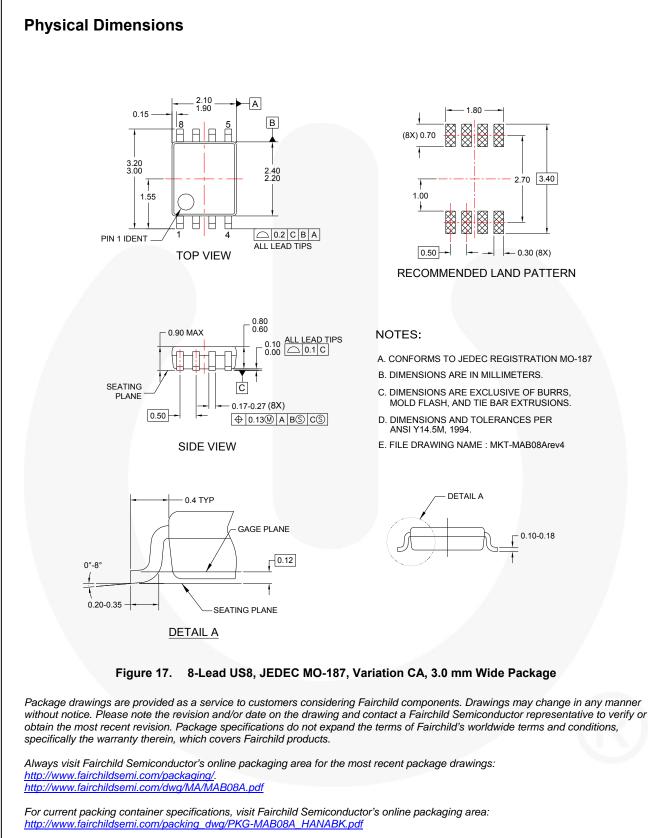
Capacitance

Symbol	Parameter	V AA	Conditions		Unit		
Symbol	Parameter	V _{cc} (V)			Тур.	Max.	Unit
C _{IN}	Control Pin Input Capacitance	0	f=1 MHz Figure 14		3		pF
C _{OFF}	B Port Off Capacitance	1.65 to 5.50	f=1 MHz Figure 14		21	-	pF
C _{ON}	A Port On Capacitance	1.65 to 5.50	f=1 MHz Figure 14		47		pF









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