



July 2009

FSA2380 — Low R_{ON} (0.75 Ω) 3:1 Negative Swing Audio Source Switch

Features

- 10µA Maximum I_{CCT} Current Over An Expanded Control Voltage Range (V_{IN}=2.6V, V_{CC}=4.3V)
- C_{ON} Capacitance 70pF Typical
- 0.75Ω Typical On Resistance (R_{ON})
- 1Bn, 2Bn Ports Support Negative Swing Audio to -2V
- -3db Bandwidth: > 120 MHz
- Low Power Consumption (1µA maximum)
- Power-Off Feature for 1A/2A Pin (I_{IN} < 2µA)</p>
- Packaged in Pb-Free 14-Pin TSSOP and DQFN

Applications

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

Description

The FSA2380 is a Double-Pole, Triple Throw (DP3T) multiplexer that routes three dual-channel sources of data or audio under the control of a single pair of select pins. The FSA2380 has special circuitry on the 1A/2A pins to allow a power-off feature. With the V_{CC} supply removed and voltage on the 1A/2A pins, there is minimal leakage current into the 1A/2A data pins. The FSA2380 also features very low quiescent current and a power-off feature to extend battery life. The low quiescent current feature allows mobile handset applications direct interface with the baseband processor general-purpose I/Os. Typical applications involve switching in portables and consumer applications, such as cell phones, digital cameras, and notebooks with hubs or controllers.

IMPORTANT NOTE:

For additional information, please contact analogswitch@fairchildsemi.com.

Ordering Information

Part Number	Top Mark	© Eco Status	Packing Description
FSA2380BQX	2380	Green	14-Terminal Depopulated very thin Quad Flat-pack No leads (DQFN) 2.5 x 3.0mm, JEDEC MO-241
FSA2380MTCX	FSA2380	RoHS	14-Lead Thin Shrink Small Outline Package (TSSOP) 4.4mm wide, JEDEC MO-153

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

Analog Symbol

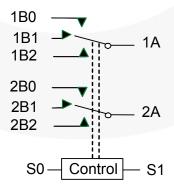
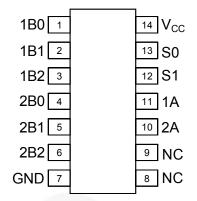
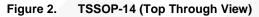


Figure 1. FSA2380 Analog Symbol

Pin Assignments





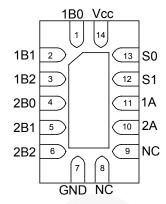


Figure 3. DQFN-14 (Top Through View)

Pin Descriptions

Name	Description
S0, S1	Switch Control Selects
1A, 2A	A Data Bus (Common)
1Bn, 2Bn	Multiplexed Source inputs

Truth Table

S1	S0	Function
LOW Logic Level	LOW Logic Level	Disconnected (Hi-Z)
LOW Logic Level	HIGH Logic Level	1B0 = 1A; 2B0 = 2A
HIGH Logic Level	LOW Logic Level	1B1 = 1A; 2B1 = 2A
HIGH Logic Level	HIGH Logic Level	1B2 = 1A; 2B2 = 2A

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	6.0	V	
W	Switch I/O Voltage ⁽¹⁾	1Bn, 2Bn Pins	V _{CC} -5.5	V _{CC} +0.3	V	
V _{SW}	Switch I/O Voltage	1A, 2A Pins	V _{CC} -5.5	V _{CC} +0.3	V	
V _{CNTRL}	Control Input Voltage ⁽¹⁾ S0, S1 Pins		-0.5	6.0	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	
В	Device Dissipation at 05°C	DQFN-14		2.5	μW	
P _D	Power Dissipation at 85°C	TSSOP-14		2.5	μW	
T _{STG}	Storage Temperature Range		-65	+150	°C	
T_J	Maximum Junction Temperature			+150	°C	
TL	Lead Temperature (Soldering, 10 seconds)			+260	°C	
		All Pins		5500		
F0D	Human Body Model (JEDEC: JESD22-A114)	I/O to GND		8000	kV	
ESD		VCC to GND		8000		
	Charged Device Model (JEDEC-JESD22-C101)			2000	kV	

Note:

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			Max.	Unit
V _{CC}	Supply Voltage		2.7	5.0	V
V _{CNTRL}	Control Input Voltage (V _{S0:S1})		0	Vcc	V
V_{SW}	Switch I/O Voltage		V _{CC} -5.5	V _{CC}	
T _A	Operating Temperature			+85	°C
0	Thermal Resistance (free air)	DQFN-14		145	°C/W
θ_{JA}	THEITHAL NESISIANCE (HEE All)	TSSOP-14	143		C/VV

The input and output negative ratings may be exceeded if the input and output diode current ratings are observed.

DC Electrical Characteristics

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

Cumb al	Doromotor	Conditions V _{cc}	V (A)	T _A = - 40°C to +85°C			1110:4
Symbol	Parameter		V _{cc} (V)	Min.	Тур.	Max.	Unit
	Analog Signal Range			V _{CC} - 5.5		Vcc	٧
V _{IK}	Clamp Diode Voltage					1.2	V
V _{IH}	Control Input Voltage		2.7 to 3.6	1.2			
	HIGH		3.6 to 4.3	1.5			V
VIL	Control Input Voltage		2.7 to 3.6			0.5	
- 12	LOW		3.6 to 4.3			0.7	
I _{IN}	Control Input Leakage	$V_{IN} = 0$ to V_{CC}	4.3			±1	μA
I _{OFF}	Power Off Leakage Current (Common Port Only 1A, 2A)	Common Port (1A, 2A) V _{SW} = 0 to 4.3V V _{CC} = 0V	0V			±10	μА
I _{NO(0FF)}	Off-Leakage Current of Port (1Bn, 2Bn)	1Bn, 2Bn or 1A, 2A = 0.3V, V _{CC} -0.5V, or Floating	4.3	-50	10	50	nA
I _{NC(0N)}	On-Leakage Current of Port 1Bn, 2Bn	1Bn, 2Bn or 1A, 2A = 0.3V, V _{CC} -0.5V, or Floating	4.3	-50	10	50	nA
R _{ON}	Switch On Resistance ⁽²⁾	1Bn or 2Bn = 0V, 0.7V, 2.0V, 2.7V; I _{ON} = -100mA See Figure 7, Figure 8	2.70		0.75	2.00	Ω
ΔR _{ON}	Delta On Resistance ⁽³⁾	1Bn or 2Bn = 0.7V, V _{CC} , I _{ON} = -100mA	2.70		0.50		Ω
R _{FLAT(ON)}	On Resistance Flatness ⁽⁴⁾	1Bn or 2Bn = 0V, 0.7V, 2.0V, 2.7V; I _{ON} = -100mA See Figure 7, Figure 8	2.7 to 4.3		0.23	0.40	Ω
lcc	Quiescent Supply Current	$V_{SW} = 0$ or V_{CC} -0.3 $I_{OUT} = 0$	4.3		22	500	nA
Ісст	Increate in Quiescent Supply Current per	V _{CNTRL} = 2.6V	4.3		2.0	10.0	μΑ
ICCI	Control Voltage and V _{CC}	V _{CNTRL} = 1.8V	7.0		6.5	15.0	μΛ

Notes:

- 2. R_{ON} measured by the voltage drop between 1Bn (2Bn) and 1A (2A) pins at identical current through the switch. R_{ON} is determined by the lower of the voltage on the two pins.
- 3. Guaranteed by characterization, not production tested.
- 4. Flatness is defined as the difference between the maximum and minimum values of on resistance over the specified range of conditions.

AC Electrical Characteristics

All typical value are for V_{CC} = 3.3V at 25°C unless otherwise specified.

Symbol	Parameter	Conditions	V _{cc} (V)	T _A = - 40°C to +85°C			Unit
				Min.	Тур.	Max.	
t _{ON}	Turn-On Time S[0:1] to Output	$V_{Bn} = 1.5V$, $R_L = 50\Omega$, $C_L = 35pF$ Figure 10, Figure 12	2.7 to 4.3		30	60	ns
t _{OFF}	Turn-Off Time S[0:1] to Output	$V_{Bn} = 1.5V$, $R_L = 50\Omega$, $C_L = 35pF$ Figure 10, Figure 12	2.7 to 4.3		22	45	ns
t _{PD}	Propagation Delay ⁽⁵⁾	$R_L = 50\Omega$, $C_L = 5pF$ Figure 13	3.3		0.25		ns
t _{BBM}	Break-Before-Make ⁽⁵⁾	$R_L = 50\Omega$, $C_L = 5pF$ $V_{IN1} = V_{IN2} = V_{IN3} = 1.5V$ Figure 11	2.7 to 4.3	1	6		ns
Q	Charge Injection	$R_{GEN} = 0\Omega$, $C_L = 100pF$, $R_L = OPEN$ Figure 14	2.7 to 4.3		9		рС
O _{IRR}	Off-Isolation	$f = 100$ kHz, $R_L = 50Ω$ Figure 4, Figure 16	2.7 to 4.3		-68		dB
Xtalk	Non-Adjacent Channel Crosstalk	$f = 100$ kHz, $R_L = 50Ω$ Figure 5, Figure 17	2.7 to 4.3		-60		dB
THD	Total Harmonic Distortion	f = 20Hz to 20kHz, R_L = 600 Ω , V_{SW} = 0.5 V_{pp} Figure 20	2.7 to 4.3		0.01		%
BW	-3db Bandwidth	$R_L = 50\Omega$, $C_L = 0$, 5pF Figure 6, Figure 15	2.7 to 4.3		120		MHz

Note:

5. Guaranteed by characterization, not production tested.

Capacitance

Cumb al	Dovometer	Conditions	$T_A = -40^{\circ}C \text{ to } +85^{\circ}C$	11
Symbol	Parameter	Conditions	Typical	Unit
C _{IN}	Control Pin Input Capacitance	V _{CC} = 0V	2.75	pF
C _{ON}	A/B On Capacitance	V _{CC} = 3.3V; S[0:1] = 01, 10, 11; f = 1MHz	70	pF
		Figure 19		
C _{OFFA}	Port 1A, 2A Off Capacitance	V _{CC} = 3.3V, S[0:1] = 00 Figure 18	42	pF
C _{OFFB}	Port 1Bn, 2Bn Off Capacitance	V _{CC} = 3.3V, S[0:1] = 00 Figure 18	20	pF

Typical Characteristics

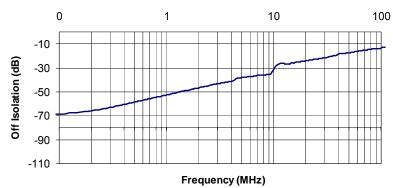


Figure 4. Off Isolation $V_{CC} = 3.3V, C_L = 0pF$

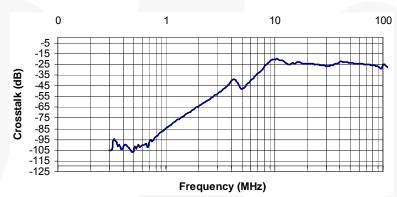


Figure 5. Non-Adjacent Crosstalk V_{CC} = 3.3V,C_L = 0pF

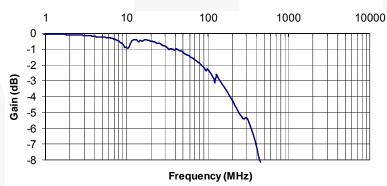
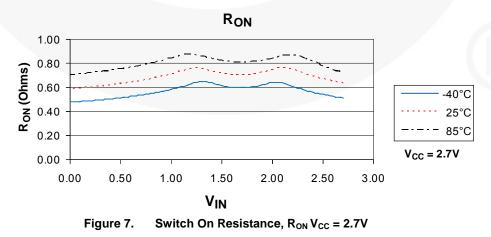
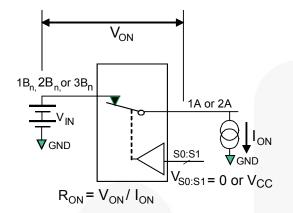
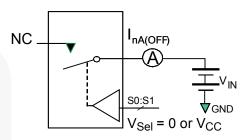


Figure 6. Bandwidth $V_{CC} = 3.3V, C_L = 0pF$



Test Diagrams

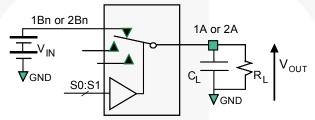




**Each switch port is tested separately

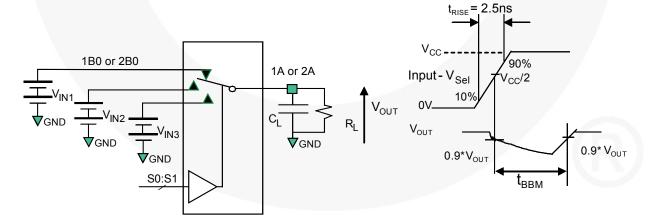
Figure 8. On Resistance

Figure 9. Off Leakage



 $\rm R_L$ and $\rm C_L$ are functions of the application environment (see AC Tables for specific values) $\rm C_L$ includes test fixture and stray capacitance

Figure 10. AC Test Circuit Load



 $R_{\scriptscriptstyle L}$ and $C_{\scriptscriptstyle L}$ are functions of the application environment (see AC Tables for specific values) $C_{\scriptscriptstyle L}$ includes test fixture and stray capacitance

Figure 11. Break-Before-Make Timing

Test Diagrams (Continued)

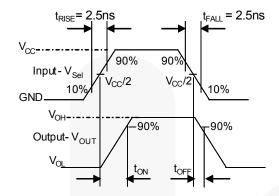


Figure 12. Turn-On / Turn-Off Waveforms

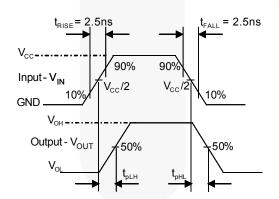


Figure 13. Switch Propagation Delay Waveforms

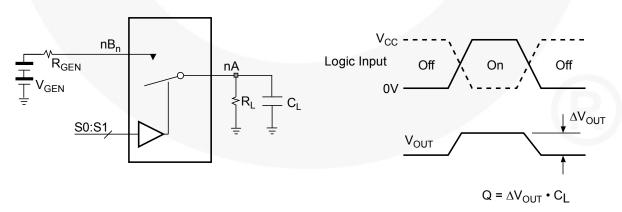


Figure 14. Charge Injection Test

Test Diagrams (Continued)

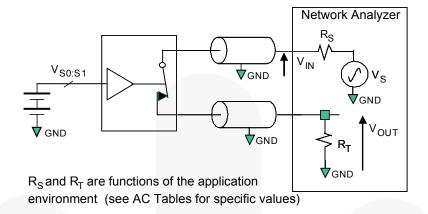


Figure 15. Bandwidth

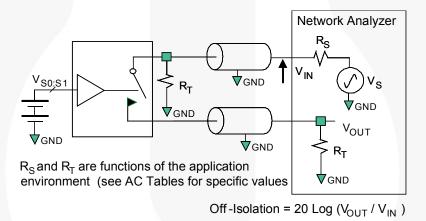


Figure 16. Channel Off Isolation

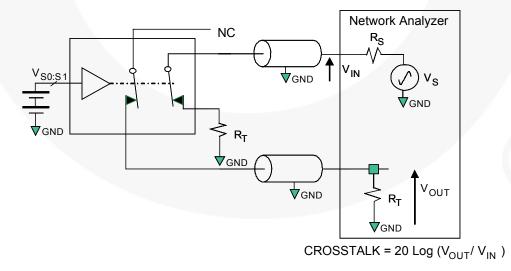


Figure 17. Non-Adjacent Channel-to-Channel Crosstalk

Test Diagrams (Continued)

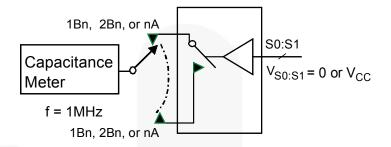


Figure 18. Channel Off Capacitance

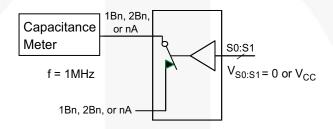


Figure 19. Channel On Capacitance

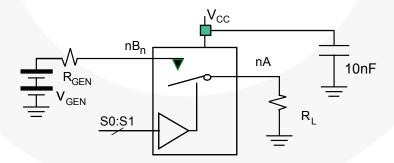
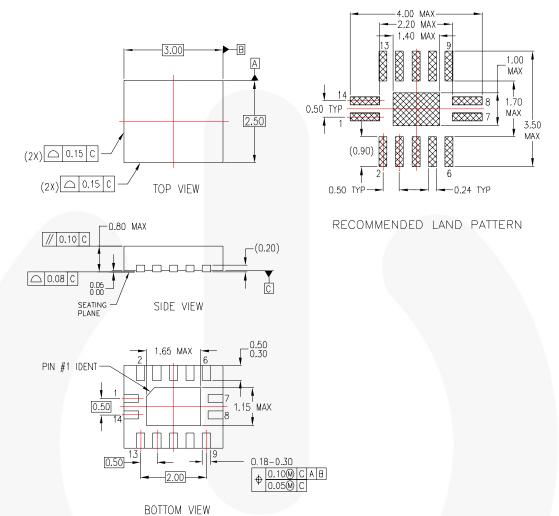


Figure 20. Total Harmonic Distortion

Physical Dimensions



NOTES:

- A. CONFORMS TO JEDEC REGISTRATION MO-241, VARIATION AA
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994

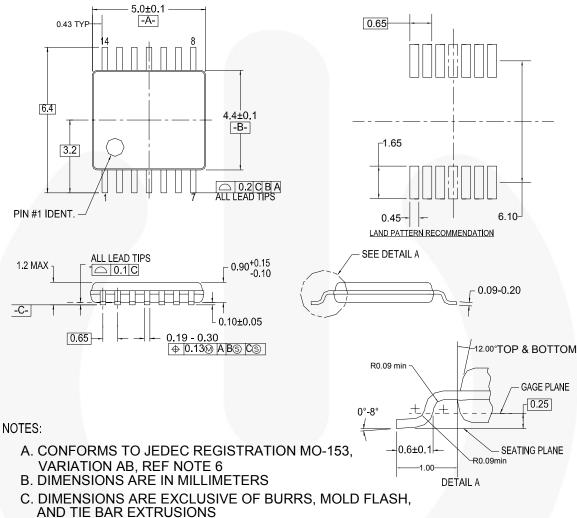
MLP14ArevA

Figure 21. 14-Terminal Depopulated, Very Thin Quad Flat-pack, No leads (DQFN)

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Physical Dimensions



- D. DIMENSIONING AND TOLERANCES PER ANSI
- Y14.5M, 1982
- E. LANDPATTERN STANDARD: SOP65P640X110-14M
- F. DRAWING FILE NAME: MTC14REV6

Figure 22. 14-Lead Thin Shrink Small Outline Package (TSSOP)

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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.		
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