

## FSA2357 — Low R<sub>ON</sub> 3:1 Analog Switch

### Features

- 10µA Maximum I<sub>CCT</sub> Current Over an Expanded Control Voltage Range: V<sub>IN</sub>=2.6V, V<sub>CC</sub>=4.5V
- On Capacitance (C<sub>ON</sub>): 70pF Typical
- 0.55Ω Typical On Resistance (R<sub>ON</sub>)
- -3db Bandwidth: > 120MHz
- Low Power Consumption (1µA maximum)
- Packaged in Pb-Free 14-Pin TSSOP and DQFN
- Priority Enable Control Circuitry

### Applications

- HDMI 5V Power Routing, LCD Monitor, TV, and Set-Top Box
- Cell Phone, PDA, Digital Camera, and Notebook


### Description

The FSA2357 is a Double-Pole, Triple Throw (DP3T) multiplexer that routes three dual-channel sources of data or audio under the control of three select pins. The FSA2357 features very low quiescent current, which 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](mailto:analogswitch@fairchildsemi.com).

### Ordering Information

Part Number	Top Mark	 Eco Status	Packing Description
FSA2357BQX	2357	Green	14-Terminal Depopulated very thin Quad Flat-pack No leads (DQFN) 2.5 x 3.0mm, JEDEC MO-241
FSA2357MTCX	FSA2357	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](http://www.fairchildsemi.com/company/green/rohs_green.html).

### Analog Symbol

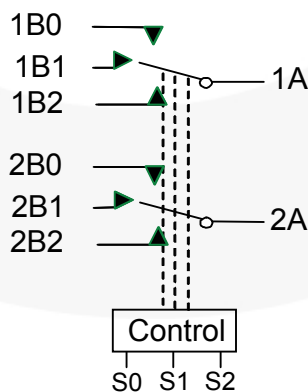


Figure 1. Analog Symbol

## Pin Configurations

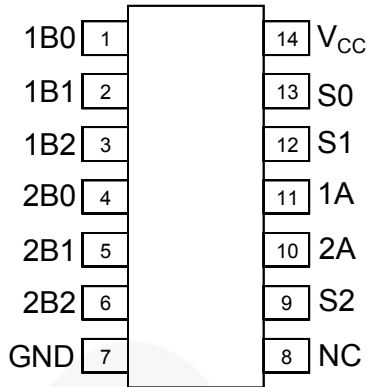


Figure 2. TSSOP-14 (Top Through View)

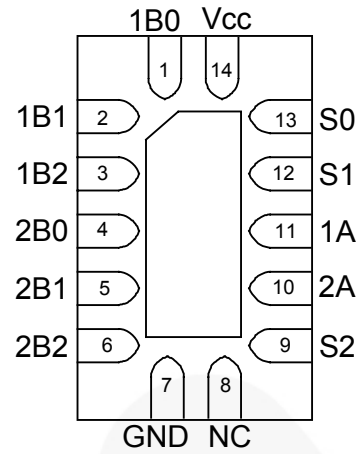


Figure 3. DQFN-14 (Top Through View)

## Pin Descriptions

Name	Description
S0, S1, S2	Switch Control Selects
1A, 2A	A Data Bus (Common)
1Bn, 2Bn	Multiplexed Source inputs

## Truth Table

S0	S1	S2	Function
HIGH	X	X	1B0 = 1A; 2B0 = 2A
LOW	HIGH	X	1B1 = 1A; 2B1 = 2A
LOW	LOW	HIGH	1B2 = 1A; 2B2 = 2A
LOW	LOW	LOW	Disconnected (Hi-Z)

## 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	
$V_{SW}$	Switch I/O Voltage <sup>(1)</sup>	1Bn, 2Bn Pins	-0.5	$V_{CC} + 0.3$	V
$V_{CNTRL}$	Control Input Voltage <sup>(1)</sup>	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	
$P_D$	Power Dissipation at 85°C	DQFN-14	2.5	$\mu$ W	
		TSSOP-14	2.5		
$T_{STG}$	Storage Temperature Range	-65	+150	°C	
$T_J$	Maximum Junction Temperature		+150	°C	
$T_L$	Lead Temperature (Soldering, 10 Seconds)		+260	°C	
ESD	Human Body Model, JEDEC: JESD22-A114	All Pins	5500	kV	
		I/O to GND	8000		
		$V_{CC}$ to GND	8000		
	Charged Device Model, JEDEC-JESD22-C101	2000			

### Note:

- 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	2.7	5.5	V
$V_{CNTRL}$	Control Input Voltage ( $V_{S0:S1}$ )	0	$V_{CC}$	V
$V_{SW}$	Switch I/O Voltage	0	$V_{CC}$	V
$T_A$	Operating Temperature	-40	+85	°C
$\theta_{JA}$	Thermal Resistance (Free Air)	DQFN-14	145	°C/W
		TSSOP-14		

## 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> = -40°C to +85°C			Unit
				Min.	Typ.	Max.	
	Analog Signal Range			V <sub>CC</sub> -5.5		V <sub>CC</sub>	V
V <sub>IK</sub>	Clamp Diode Voltage					1.2	V
V <sub>IH</sub>	Control Input Voltage HIGH		2.7 to 3.6 3.6 to 4.5	1.2			V
				1.5			
V <sub>IL</sub>	Control Input Voltage LOW		2.7 to 3.6 3.6 to 4.5			0.5	
						0.7	
I <sub>IN</sub>	Control Input Leakage	V <sub>IN</sub> = 0 to V <sub>CC</sub>	4.5			±1	μA
I <sub>NO(OFF)</sub>	Off-Leakage Current of Port (1Bn, 2Bn)	1Bn, 2Bn or 1A, 2A = 0.3V, V <sub>CC</sub> -0.3V, or Floating	5.5	-100	10	100	nA
I <sub>NC(ON)</sub>	On-Leakage Current of Port 1Bn, 2Bn	1Bn, 2Bn or 1A, 2A = 0.3V, V <sub>CC</sub> -0.3V, or Floating	5.5	-100	10	100	nA
R <sub>ON</sub>	Switch On Resistance <sup>(2)</sup>	1Bn or 2Bn = 0V, 0.7V, 2.0V, 2.7V; I <sub>ON</sub> = -100mA Figure 4	2.7		0.75	2.00	Ω
			4.5		0.55	0.90	
ΔR <sub>ON</sub>	Delta On Resistance <sup>(3)</sup>	1Bn or 2Bn = 0.7V, V <sub>CC</sub> , I <sub>ON</sub> = -100mA	2.7		0.50		Ω
			4.5		0.30		
R <sub>FLAT(ON)</sub>	On Resistance Flatness <sup>(4)</sup>	1Bn or 2Bn = 0V, 0.7V, 2.0V, 2.7V; I <sub>ON</sub> = -100mA Figure 4	2.7 to 4.5		0.23	0.40	Ω
I <sub>CC</sub>	Quiescent Supply Current	V <sub>SW</sub> = 0 or V <sub>CC</sub> -0.3 I <sub>OUT</sub> = 0	5.5		22	500	μA
I <sub>CC(T)</sub>	Increase in Quiescent Supply Current per Control Voltage and V <sub>CC</sub>	V <sub>CTRL</sub> = 3.3V	5.5		5	20	μA

### Notes:

- R<sub>ON</sub> measured by the voltage drop between 1Bn (2Bn) and 1A (2A) pins at identical current through the switch. R<sub>ON</sub> is determined by the lower of the voltage on the two pins.
- Guaranteed by characterization; not production tested.
- 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 values are for  $V_{CC} = 3.3V$  at  $25^{\circ}C$  unless otherwise specified.

Symbol	Parameter	Conditions	$V_{CC}$ (V)	$T_A = -40^{\circ}C$ to $+85^{\circ}C$			Unit
				Min.	Typ.	Max.	
$t_{ON}$	Turn-On Time S[0:1] to Output	$V_{Bn} = 1.5V$ , $R_L = 50\Omega$ , $C_L = 35pF$ Figure 8	2.7 to 4.5		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 8	2.7 to 4.5		38	80	ns
$t_{PD}$	Propagation Delay <sup>(5)</sup>	$R_L = 50\Omega$ , $C_L = 5pF$ Figure 9	3.6		0.25		ns
$t_{BBM}$	Break-Before-Make <sup>(5)</sup>	$R_L = 50\Omega$ , $C_L = 5pF$ $V_{IN1} = V_{IN2} = V_{IN3} = 1.5V$	2.7 to 4.5	1.0	6.0		ns
Q	Charge Injection	$R_{GEN} = 0\Omega$ , $C_L = 100pF$ , $R_L = OPEN$ Figure 10	2.7 to 4.5		9		pC
$O_{IRR}$	Off-Isolation	$f = 100kHz$ , $R_L = 50\Omega$ Figure 12	2.7 to 4.5		-68		dB
Xtalk	Non-Adjacent Channel Crosstalk	$f = 100kHz$ , $R_L = 50\Omega$ Figure 13	2.7 to 4.5		-60		dB
THD	Total Harmonic Distortion	$f = 20Hz$ to $20kHz$ , $R_L = 600\Omega$ , $V_{SW} = 0.5V_{pp}$ Figure 16	2.7 to 4.5		0.01		%
BW	-3db Bandwidth	$R_L = 50\Omega$ , $C_L = 0$ , $5pF$ Figure 11	2.7 to 4.5		90		MHz

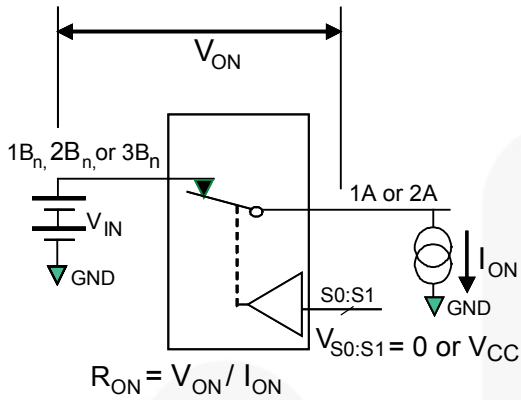
### Note:

5. Guaranteed by characterization; not production tested.

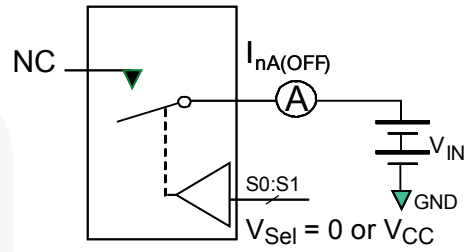
## Capacitance

Symbol	Parameter	Conditions	$T_A = -40^{\circ}C$ to $+85^{\circ}C$		Unit
			Typical		
$C_{IN}$	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, $f = 1MHz$ Figure 15	70		pF
$C_{OFFA}$	Port 1A, 2A Off Capacitance	$V_{CC} = 3.3V$ , S[0:1] = 00 Figure 14	42		pF
$C_{OFFB}$	Port 1Bn, 2Bn Off Capacitance	$V_{CC} = 3.3V$ , S[0:1] = 00 Figure 14	20		pF

## Test Diagrams

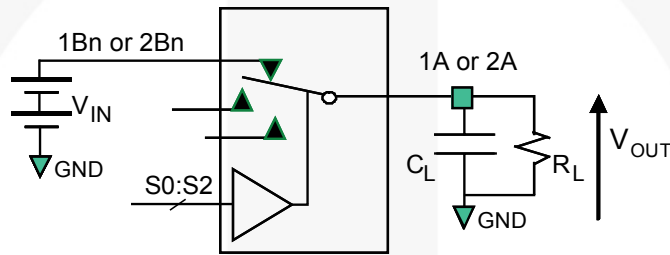


**Figure 4. On Resistance**



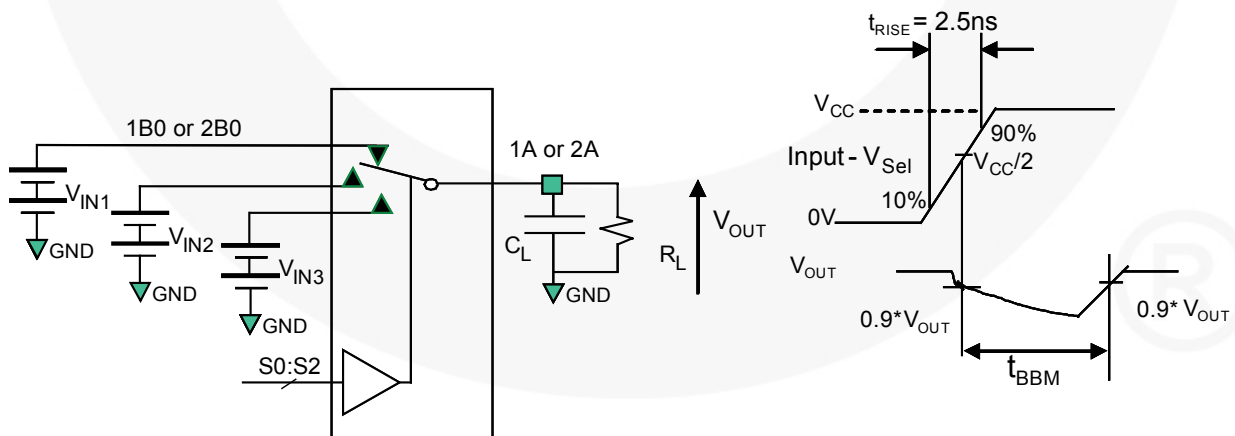
\*\*Each switch port is tested separately

**Figure 5. Off Leakage**



$R_L$  and  $C_L$  are functions of the application environment (see tables for specific values).  $C_L$  includes test fixture and stray capacitance.

**Figure 6. AC Test Circuit Load**



$R_L$  and  $C_L$  are functions of the application environment (see tables for specific values).  $C_L$  includes test fixture and stray capacitance.

**Figure 7. Break-Before-Make Timing**

Test Diagrams (Continued)

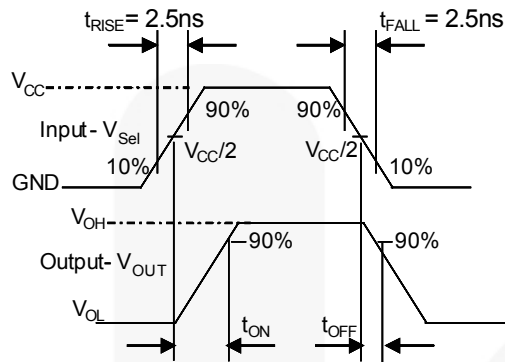


Figure 8. Turn-On / Turn-Off Waveforms

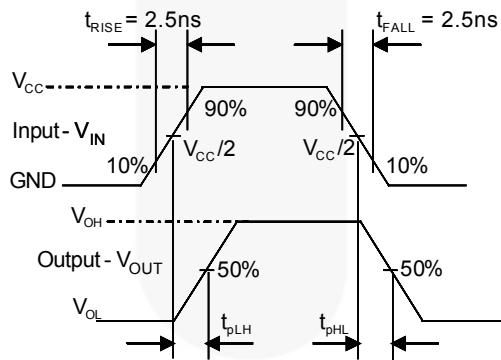


Figure 9. Switch Propagation Delay Waveforms

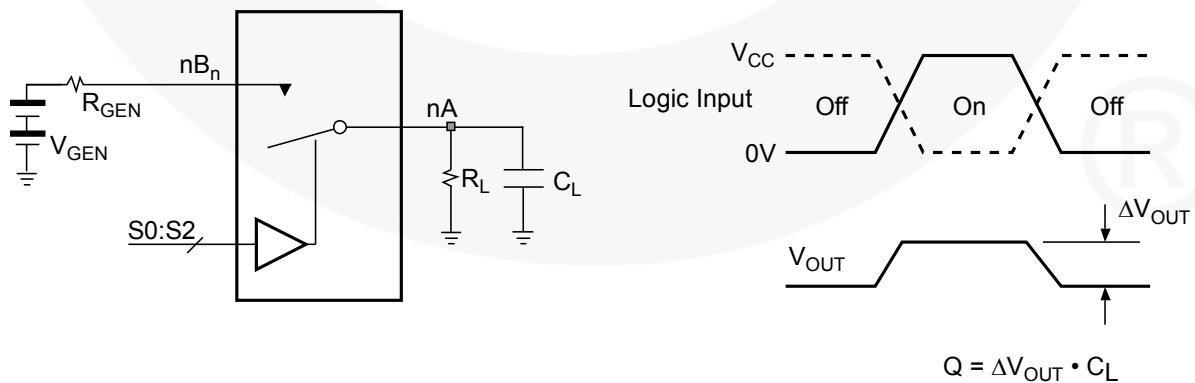
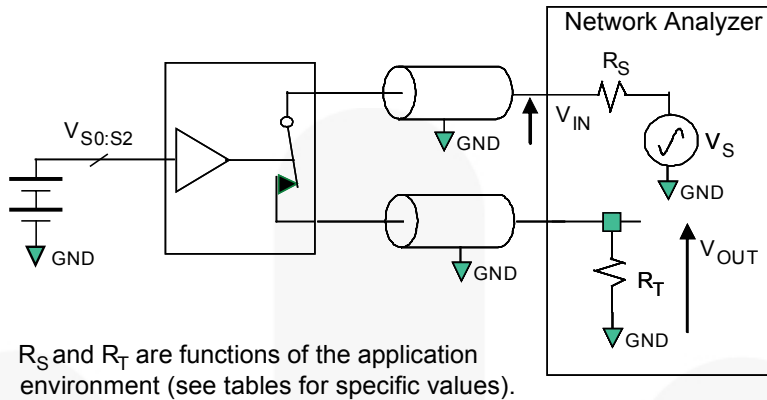
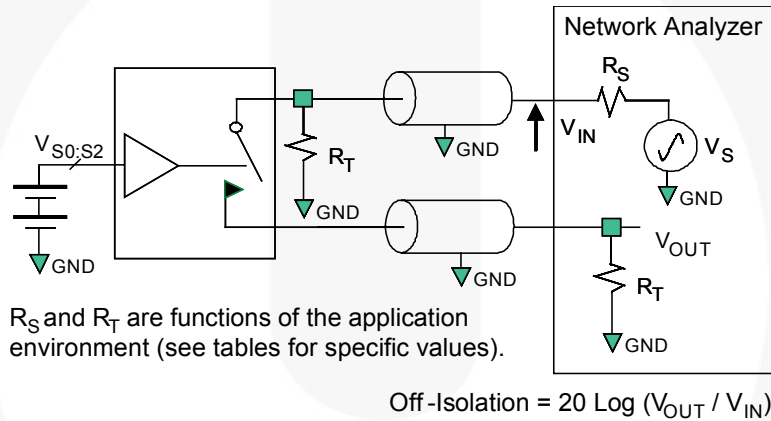


Figure 10. Charge Injection Test

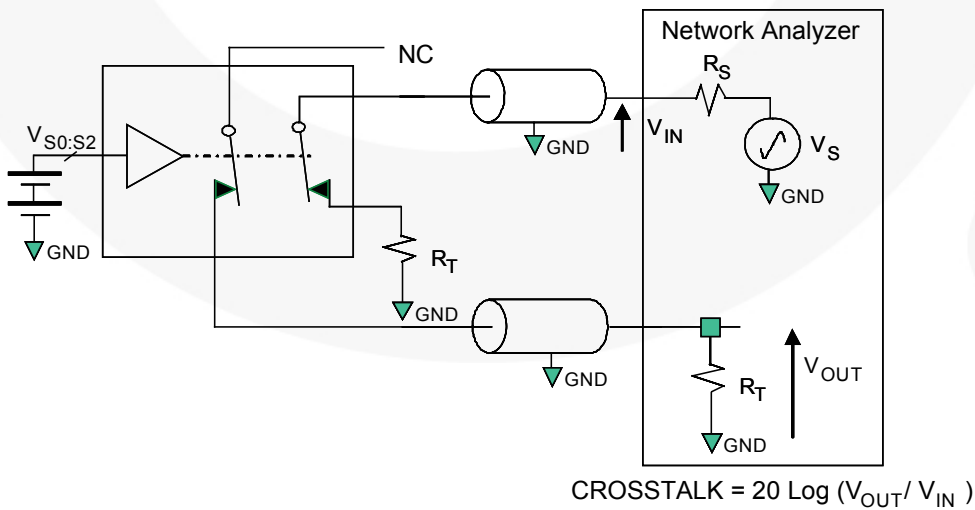
**Test Diagrams** (Continued)



**Figure 11. Bandwidth**



**Figure 12. Channel Off Isolation**



**Figure 13. Non-Adjacent Channel-to-Channel Crosstalk**



Test Diagrams (Continued)

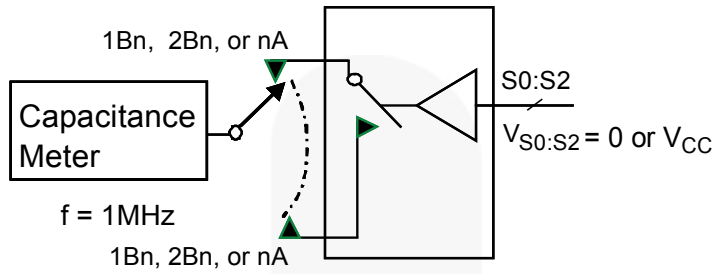


Figure 14. Channel Off Capacitance

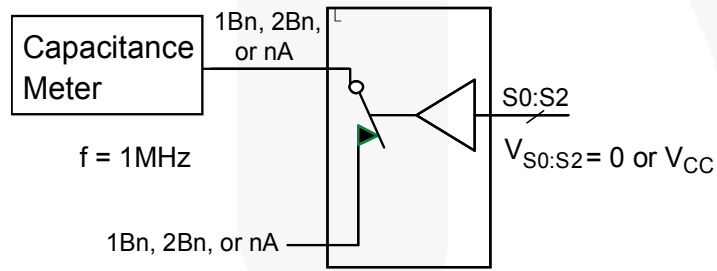


Figure 15. Channel On Capacitance

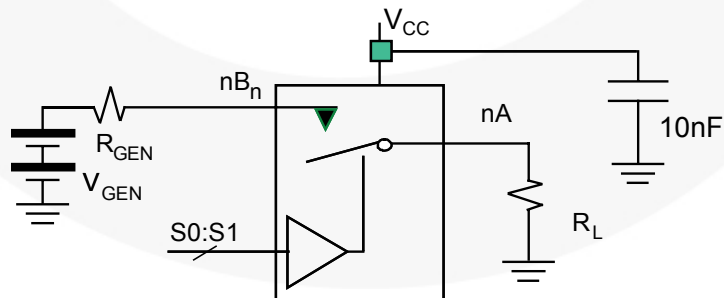
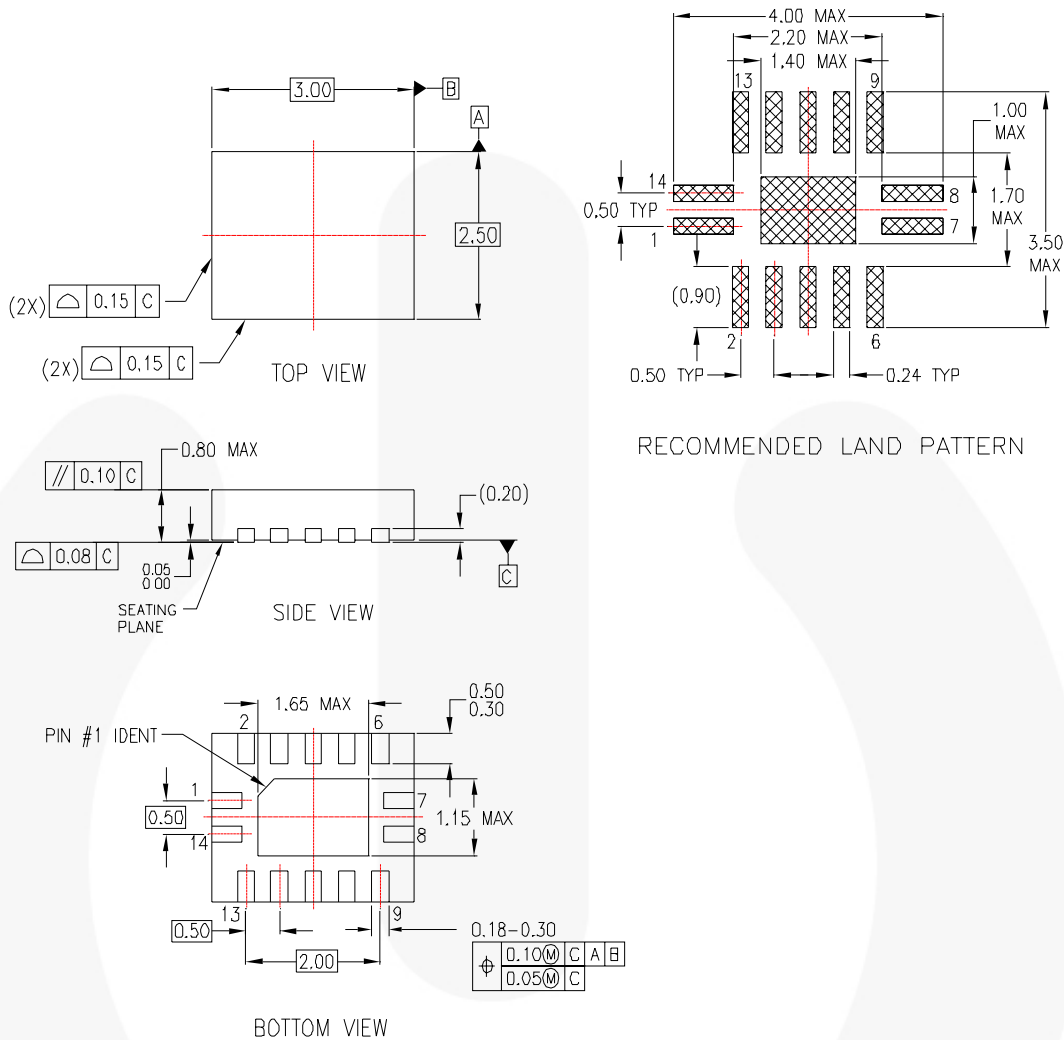


Figure 16. Total Harmonic Distortion

## 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

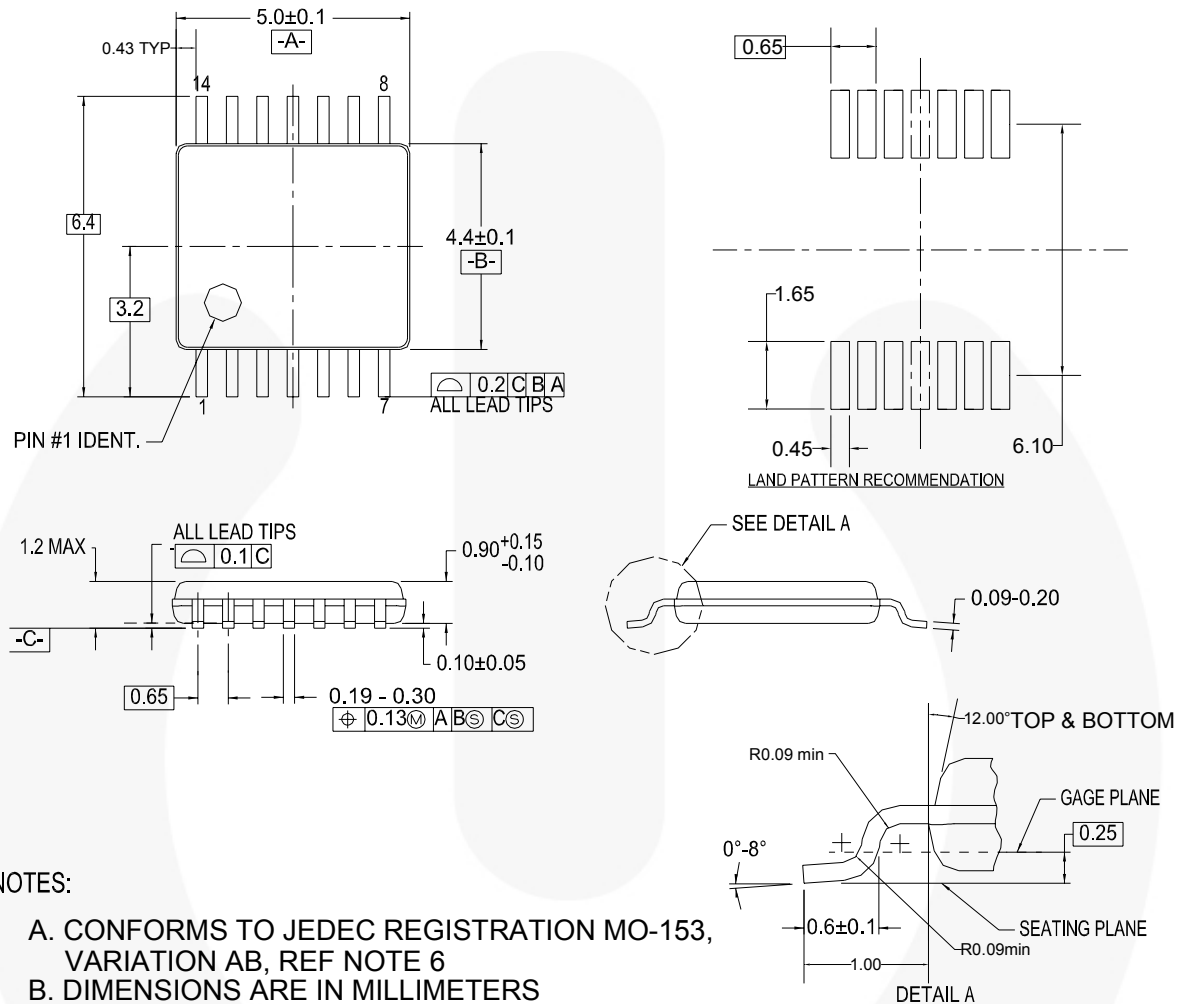
MLP14ArevA

**Figure 17. 14-Terminal Depopulated Very Thin Quad Flat-Pack, No leads (DQFN)**

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. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AB, REF NOTE 6
- B. DIMENSIONS ARE IN MILLIMETERS
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS
- D. DIMENSIONING AND TOLERANCES PER ANSI Y14.5M, 1982
- E. LANDPATTERN STANDARD: SOP65P640X110-14M
- F. DRAWING FILE NAME: MTC14REV6

Figure 18. 14-Lead Thin Shrink Small Outline Package (TSSOP)







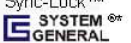
Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications 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/>



**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.

- |   |   |   |   |
|---|---|---|---|
| AccuPower™  | FPST™   | PowerTrench®  | The Power Franchise®  |
| Auto-SPM™   | F-PFST™   | PowerXS™  |  |
| Build it Now!™  | FRFET®  | Programmable Active Droop™  | TinyBoost™  |
| CorePLUSTM  | Global Power Resource™  | QFET®   | TinyBuck™   |
| CorePOWER™  | Green FPS™  | QST™  | TinyCalc™   |
| CROSSVOLT™  | Green FPS™ e-Series™  | Quiet Series™   | TinyLogic®  |
| CTL™  | Gmax™   | RapidConfigure™   | TINYOPTO™   |
| Current Transfer Logic™   | GTO™  |  | TinyPower™  |
| EcoSPARK®   | IntelliMAX™   | Saving our world, 1mW/W/kW at a time™   | TinyPWM™  |
| EfficientMax™   | ISOPLANAR™  | SmartMax™   | TinyWire™   |
| EZSWITCH™   | MegaBuck™   | SMART START™  | TriFault Detect™  |
|  | MICROCOUPLER™   | SPM®  | TRUECURRENT™  |
|  | MicroFET™   | STEALTH™  | µSerDes™  |
| Fairchild®  | MicroPak™   | SuperFET™   |  |
| Fairchild Semiconductor®  | MillerDrive™  | SuperSOT™.3   | UHC®  |
| FACT Quiet Series™  | MotionMax™  | SuperSOT™.6   | Ultra FRFET™  |
| FACT®   | Motion-SPM™   | SuperSOT™.8   | UniFET™   |
| FAST®   | OPTOLOGIC®  | SupreMOS™   | VCM™  |
| FastvCore™  | OPTOPLANAR®   | SyncFET™  | VisualMax™  |
| FETBench™   |  | Sync-Lock™  | XST™  |
| FlashWriter®  | PDP SPM™  |  |   |
|   | Power-SPM™  |   |   |

\* 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. I41