FM3418

0.1 to 3.0 GHz SP8T Antenna SWITCH

PRODUCT DESCRIPTION

The FM3418 is a single-pole, eight-throw (SP8T) antenna switch. The high linearity performance and low insertion loss achieved by the FM3418 make it an ideal choice for main/diversity switching commonly used in LTE-based handsets, data cards, and tablets that use antenna diversity solutions. The FM3418 is part of a scalable family of products that covers SP4T through SP8T switches that allow up to eight bands of WCDMA/LTE.

- FM3414 SP4T Antenna Switch
- FM3416 SP6T Antenna Switch
- FM3418 SP8T Antenna Switch (this Data Sheet)

The symmetric port designs provide flexibility in signal routing for both receive diversity and higher power TD-SCDMA/TDD-LTE, WCDMA/FDD, and LTE transmit/receive applications.

Switching is controlled by three CMOS/TTL compatible control voltage inputs (V1, V2, and V3). Depending on the logic voltage level applied to the control pins, the ANT pin is connected to one of eight switched RF input/output (I/O) ports (RF1 to RF8) using a low insertion loss path, while the paths between the ANT pin and the other RF pins are in a high isolation state. No external blocking capacitors are required on the RF paths unless VDC is applied externally.

The FM3418 is manufactured in a compact, 14-pin 2.0 x 2.0 mm, Quad Flat No-Lead (QFN) package.

A functional block diagram is shown in Figure 1. The pin configuration and package are shown in Figure 2. Signal pin assignments and functional pin descriptions are provided in Table 1.

FEATURES

- Broadband frequency range: 0.1 to 3.0 GHz
- Low insertion loss: 0.75 dB typical @ 2.7 GHz
- High isolation: >18 dB @ 2.7 GHz Integrated logic
- Small QFN (14-pin, 2.0 x 2.0 mm) package (MSL1, 260℃ per JEDEC J-STD-020)

APPLICATIONS

- Any 2G/3G/4G antenna diversity or LTE (TDD/FDD) transmit/receive system for which GSM transmit is not required

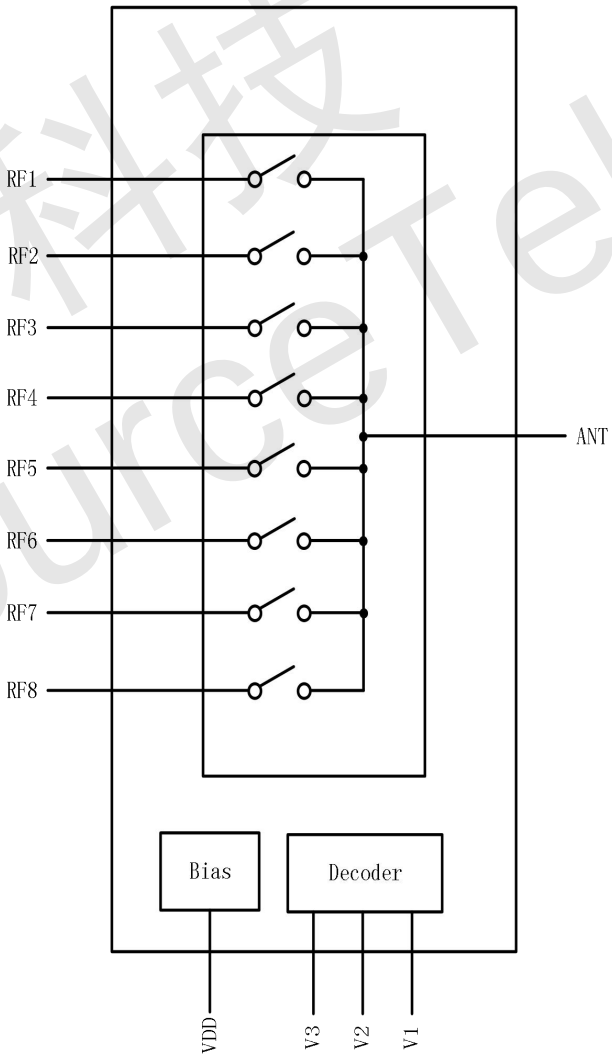

Figure 1. FM3418 Block Diagram

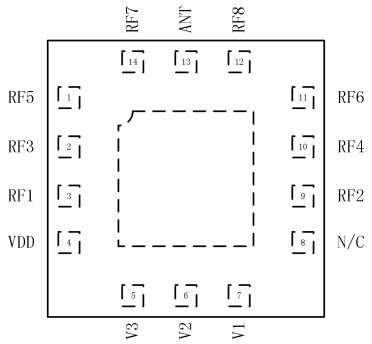

Figure 2. FM3418 Pinout – 14-Pin QFN (Top View)

Table 1.FM3418 Signal Descriptions (Note 1)

Pin#	Name	Description	Pin#	Name	Description
1	RF5	RF I/O path 5	8	N/C	Not connected
2	Rf3	RF I/O path 3	9	RF2	RF I/O path 2
3	RF1	RF I/O, port 1	10	RF4	RF I/O path 4
4	VDD	DC power supply	11	RF6	RF I/O path 6
5	V3	DC control voltage 3	12	RF8	RF I/O path 8
6	V2	DC control voltage 2	13	ANT	Antenna port
7	V1	DC control voltage 1	14	RF7	RF I/O path 7

Note 1: Bottom ground paddles must be connected to ground.

Table 2. FM3418 Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Minimum	Maximum	Unit
Supply voltage	VDD	+2.5	+4.8	V
Control voltage(V1,V2,and V3)	VCTL	-0.5	3	V
RF input power(RF1 to RF8)	P_{IN}		+32	dBm
Operating temperature	T_{OP}	-40	+90	℃
Storage temperature	T_{STG}	-55	+150	℃
Electrostatic Discharge: Human Body Model (HBM), Class 1C	ESD		1000	V

Note: Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

CAUTION: Although this device is designed to be as robust as possible, electrostatic discharge (ESD) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions should be used at all times.

Functional Description

The FM3418 includes an internal negative voltage generator and decoder that eliminate the need for external DC blocking capacitors on the RF ports. No external components are required for proper operation. DC decoupling capacitors may be added on the VDD and control lines if necessary.

Switching is controlled by three control voltage inputs, V1, V2, and V3. Depending on the logic voltage level applied to the control pins, the antenna pin is connected to one of eight switched RF outputs.

The recommended startup sequence is:

1. Apply VDD
2. Apply V1, V2, and V3 voltages
3. Apply RF input the device must be turned off in reverse order.

Electrical and Mechanical Specifications

The absolute maximum ratings of the FM3418 are provided in Table 2. Electrical specifications are provided in Table 3.

The state of the FM3418 is determined by the logic shown in Table 4.

Table 3. FM3418 General Electrical Specifications (Note 1)

(V_{DD} = 2.85V,V1=V2=V3=0/1.8V,P_{IN} =0dBm,T_{OP} = +25 °C, Characteristic Impedance [Z_O] = 50 Ω,

Unless Otherwise Specified)

Parameter	Symbol	Test Condition (Note 2)	Min	Typical	Max	Units
DC Specifications						
Supply voltage	V_{DD}		2.5	2.85	4.2	V
Supply current	I_{DD}			35	55	uA
Control voltage: High Low	 V_{CTL_H} V_{CTL_L}		 1.35	 1.80	 2.70 0.3	 V V
Control current	I_{CTL}	V_{CTL} = 1.8 V		0.5	1.0	uA
Turn-on switching time	t_{ON}	50% of final control voltage to 90% of final RF power, switching between RF1/2/3/4/5/6/7/8		1.5	2.2	us
RF Specifications						
Insertion loss (ANT pin to RFx pins)	IL	0.1 to 1.0 GHz 1.0 to 2.0 GHz 2.0 to 2.7 GHz		0.50 0.65 0.75	0.60 0.80 0.95	dB dB dB
Isolation (ANT pin to RFx pins)	Iso	0.1 to 1.0 GHz 1.0 to 2.0 GHz 2.0 to 2.7 GHz	30 23 18	35 27 20		dB dB dB
Second harmonics (ANT pin to RFx pins)	2fo	P_{IN} = +26 dBm, 0.1 to 3.0 GHz	+72	+75		dBc
Third harmonics (ANT pin to RFx pins)	3fo	P_{IN} = +26 dBm, 0.1 to 3.0 GHz	+72	+75		dBc
0.1 dB Compression Point (ANT pin to RFx pins)	P0.1dB	0.8 GHz to 3.0 GHz		+32		dBm

Table 4. FM3418 Control Logic (Note 1)

Control Pins			Switched RF I/O							
V1 (Pin 7)	V2 (Pin 6)	V3 (Pin 5)	RF1 (Pin 3)	RF2 (Pin 9)	RF3 (Pin 2)	RF4 (Pin 10)	RF5 (Pin 1)	RF6 (Pin 11)	RF7 (Pin 14)	RF8 (Pin 12)
0	0	0	**Insertion Loss**	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation
0	0	1	Isolation	**Insertion Loss**	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation
0	1	0	Isolation	Isolation	**Insertion Loss**	Isolation	Isolation	Isolation	Isolation	Isolation
0	1	1	Isolation	Isolation	Isolation	**Insertion Loss**	Isolation	Isolation	Isolation	Isolation
1	0	0	Isolation	Isolation	Isolation	Isolation	**Insertion Loss**	Isolation	Isolation	Isolation
1	0	1	Isolation	Isolation	Isolation	Isolation	Isolation	**Insertion Loss**	Isolation	Isolation
1	1	0	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation	**Insertion Loss**	Isolation
1	1	1	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation	**Insertion Loss**

Note 1: “High” = 1.8 V; “Low” = 0 V. Any state other than that described in this Table places the switch into an undefined state. An undefined state will not damage the device.

Handling Information

FM3418 application schematic is shown in Figure.3. Component value is shown in Table 5.

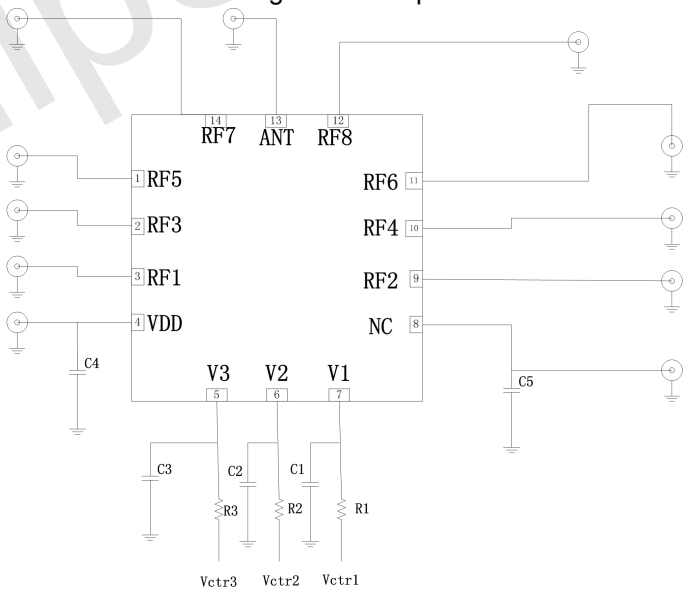

Figure 3. FM3418 Application Schematic

Table 5. FM3418 Application Schematic Component Value

Component	Value	Size	Note
C1	10pF	0402	Optional
C2	10pF	0402	Optional
C3	10pF	0402	Optional
C4	100pF	0402	
C5	NC		Optional
R1	0ohm	0402	
R2	0ohm	0402	
R3	0ohm	0402	

Package Dimensions

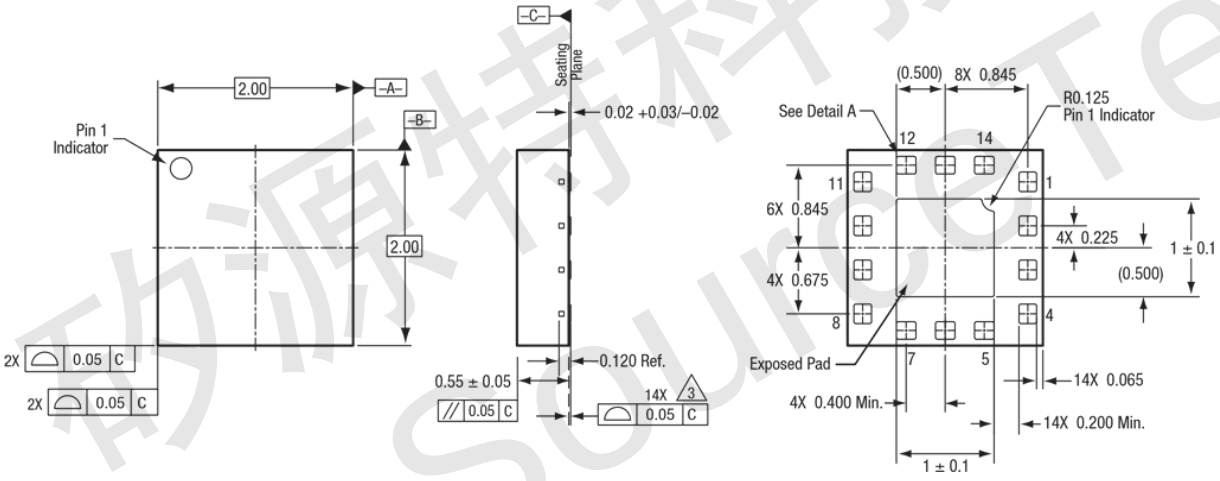

Figure 4. FM3418 14-Pin QFN Package Dimensions