FM8544A

SP4T Switch for 4G/5G Applications

Features

- Broadband frequency range: 0.1 to 3.0GHz
- Low insertion loss: 0.70dB @2.7GHz
- High P0.1dB of 43dBm
- Off Ports, “Open Type”
- Three pin GPIO control Interface for multi-on application
- Small QFN (10-pin, 1.1mm x 1.5mm x 0.45mm) package，MSL1

Applications

- GSM/WCDMA/LTE band and mode switching
- Antenna tuning switch

Description

The FM8544A is a CMOS silicon-on-insulator (SOI), single- pole, four-throw (SP4T) switch. The high linearity and ruggedness performance and extremely low insertion loss makes the device an ideal choice for GSM/WCDMA/LTE handset antenna tuning application.

The FM8544A SP4T switch is provided in a compact QFN 1.1mm x 1.5mm x 0.45mm 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.

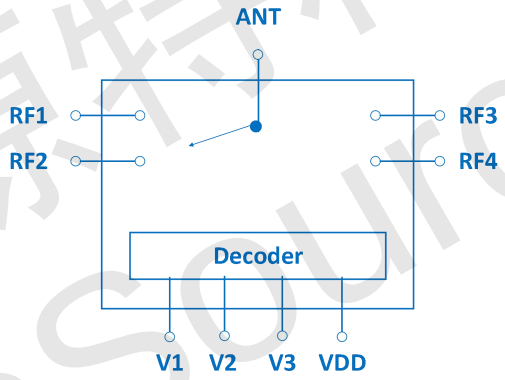

Figure 1 Functional Block Diagram

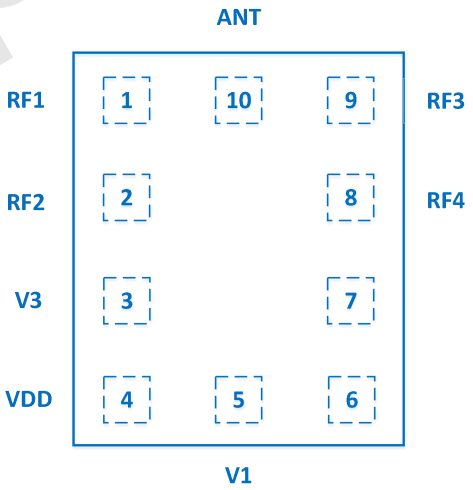

Figure 2 Pin-Out(Top View)

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Function Characteristics

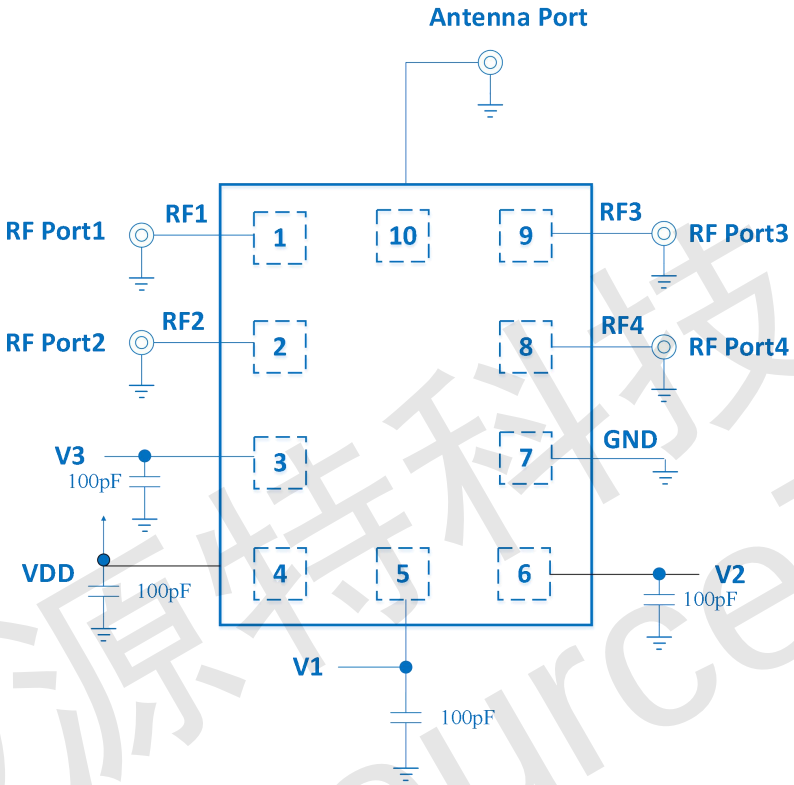

Figure 3 Application Circuit

Table 1 Pin Description

No.	Name	Description	No.	Name	Description
1	RF1	RF Port 1	6	V2	Logic Control Voltage 2
2	RF2	RF Port 2	7	GND	Ground
3	V3	Logic Control Voltage 3	8	RF4	RF Port 4
4	VDD	DC Power Supply	9	RF3	RF Port 3
5	V1	Logic Control Voltage 1	10	ANT	Antenna Port

Table 2 VC Truth Table of for RF Channel Operating Mode

V1	V2	V3	RF Channel Operating Mode
Low	Low	High	All Ron
Low	High	High	ANT to RF1 and RF2

High	Low	High	ANT to RF3 and RF4
Low	Low	Low	ANT to RF1
Low	High	Low	ANT to RF2
High	Low	Low	ANT to RF3
High	High	Low	ANT to RF4
High	High	High	All isolation

Electrical Characteristics

Table 3 Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
DC Supply Voltage	VDD	-0.3	+4.8	V
Digital Control Voltage	VC	-0.3	+3.3	V
RF Input Peak Power				
Max Input Power between any combination of RF ports or ground VRF, VDD = 2.85VDC, VCTL1/2 = 0/1.8VDC, Temp = 25℃ @20% DC	PIN		+43	dBm
Max voltage between any combination of RF ports or ground VRF, VDD = 2.85VDC, VCTL1/2 = 0/1.8VDC, Temp = 25℃ @20% DC	Vpeak		60	V
Device Operating Temperature	TOP	-40	+90	℃
Device Storage Temperature	TSTG	-55	+150	℃
Electrostatic Discharge				
Human Body Model (HBM), Class 2	VESD(HBM)	1000		V
Charged Device Model (CDM), Class III	VESD(CDM)	1000		V

Notice

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.

Table 4 Recommended Operating Conditions

Parameter	Symbol	MIN	TYP	MAX	Unit
Operating Frequency	F_0	0.1		3.0	GHz
DC Supply Voltage	V_{DD}	2.5	2.8	4.2	V
Logic Control Voltage High	V_{CH}	1.0	1.8	3.0	V
Logic Control Voltage Low	V_{CL}	0	0	0.3	V

Table 5 Nominal Operating Parameters

Parameter	Symbol	Specification			Unit	Condition
		MIN	TYP	MAX		
Normal Condition	V_{DD}=2.8V, V_{CH}=1.8V, V_{CL}=0V, P_{IN}=0dBm, Z_O=50Ω, T_A=25℃, Unless Otherwise Stated					
DC Performances						
DC Supply Current	I_{DD}		80	120	μA	
Current on Logic Control	I_C		1	5	μA	
Startup Time	TON		10	20	μs	50% of final VDD to 90% of the final RF
Switching Speed	TSW		4	5	μs	50% of final VC to 90%/10% of the final RF
RF Performances						
Insertion Loss (ANT to RF1/2/3/4)	IL		0.30 0.50 0.70	0.35 0.60 0.85	dB dB dB	F_0=0.8 to 1.0GHz F_0=1.0 to 2.2GHz F_0=2.2 to 3.0GHz
Isolation (ANT to RF1/2/3/4)	ISO	21 17 12	23 20 14		dB dB dB	F_0=0.8 to 1.0GHz F_0=1.0 to 2.2GHz F_0=2.2 to 3.0GHz
Return Loss (ANT to RF1/2/3/4)	RL		15		dB	F_0=0.8 to 3.0GHz
On Resistance (ANT to RF1/2/3/4)	RON		1.0	1.5	Ω	Switch On Path@DC
Off Capacitance (ANT to RF1/2/3/4)	COFF		150	170	fF	Switch Off Path@500MH

Peak RF Operating Voltage	VRF		60		V	F0=950MHz, 20% duty cycle
LTE TX Harmonic (RF1/2/3/4 to ANT)	2F0		-70	-65	dBm	F0= 0.7 to 2.7GHz @+26dBm
	3F0		-75	-65	dBm	
GSM LB Harmonic (RF1/2/3/4 to ANT)	2F0		-60	-52	dBm	F0= 824 to 915MHz @+35dBm
	3F0		-70	-60	dBm	
GSM HB Harmonic (RF1/2/3/4 to ANT)	2F0		-65	-58	dBm	F0= 1710 to 2690MHz @+33dBm
	3F0		-70	-60	dBm	

Tape and Reel Dimensions

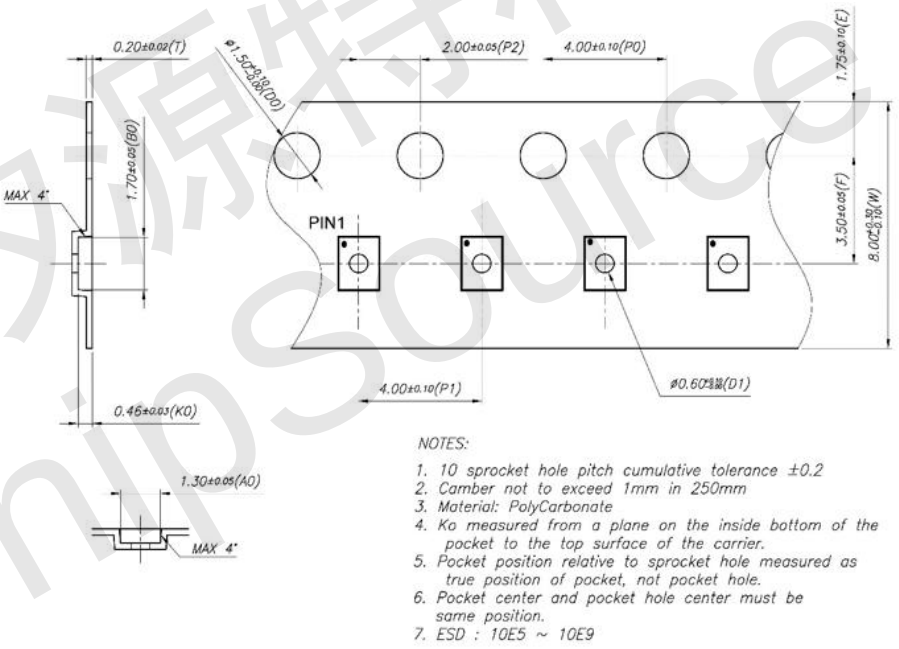

Figure 6 Tape and Reel Dimensions

Reflow Chart

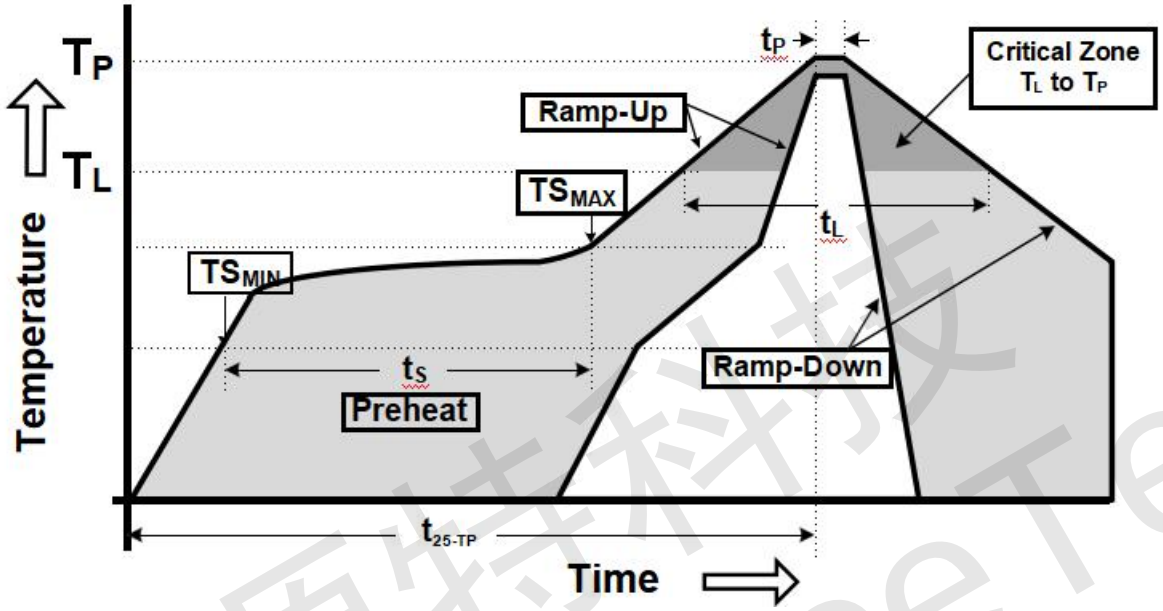

Figure 7 Recommended Lead-Free Reflow Profile

Table 7 Reflow Chart Parameters

Reflow Profile	Parameter
Preheat Temperature(TSMIN to TSMAX)	150℃ to 200℃
Preheat Time(t_S)	60 to 180 Seconds
Ramp-Up Rate(TS_{MAX} to T_P)	3℃/s MAX
Time Above T_L 217℃(t_L)	60 to 150 Seconds
Peak Temperature (T_P)	260℃
Time within 5℃ of Peak Temperature(t_P)	20 to 40 Seconds
Ramp-Down Rate(TS_{MAX} to T_P)	6℃/s MAX
Time for 25℃ to Peak Temperature($t_{25\text{-}TP}$)	8 Minutes MAX

ESD Sensitivity

Integrated circuits are ESD sensitive and can be damaged by static electric charge. Proper ESD protection techniques should be applied when devices are operating.

RoHS Compliant

This product does not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE), and is considered RoHS compliant.