MXD8641

SP4T Switch for 2G/3G/4G Rx Applications

General Description

The MXD8641 is a SOI SP4T switch suitable for GSM/LTE/UMTS/CDMA receive applications. The MXD8641 features very low insertion loss, high isolation and excellent linearity performance down to 1.0V control voltage at high frequency up to 2.7GHz. The MXD8641 has internal ESD protection devices to achieve excellent ESD performances. No DC Blocking capacitors are required for all RF ports unless DC is biased externally. And the compact QFN-14L 2mm×2mm×0.55mm package is adopted.

Applications

- 2G/3G/4G RX applications
- Cellular modems and USB Devices

Features

- Excellent insertion loss and isolation performance
  - 0.4 dB Insertion Loss at 2.7GHz
  - 25 dB Isolation at 2.7GHz
- Multi-Band operation 100MHz to 3000MHz
- P0.1dB of 27dBm
- Compact 2mm x 2mm in QFN-14 package
- No DC blocking capacitors required (unless external DC is applied to the RF ports)

Functional Block Diagram and Pin Function

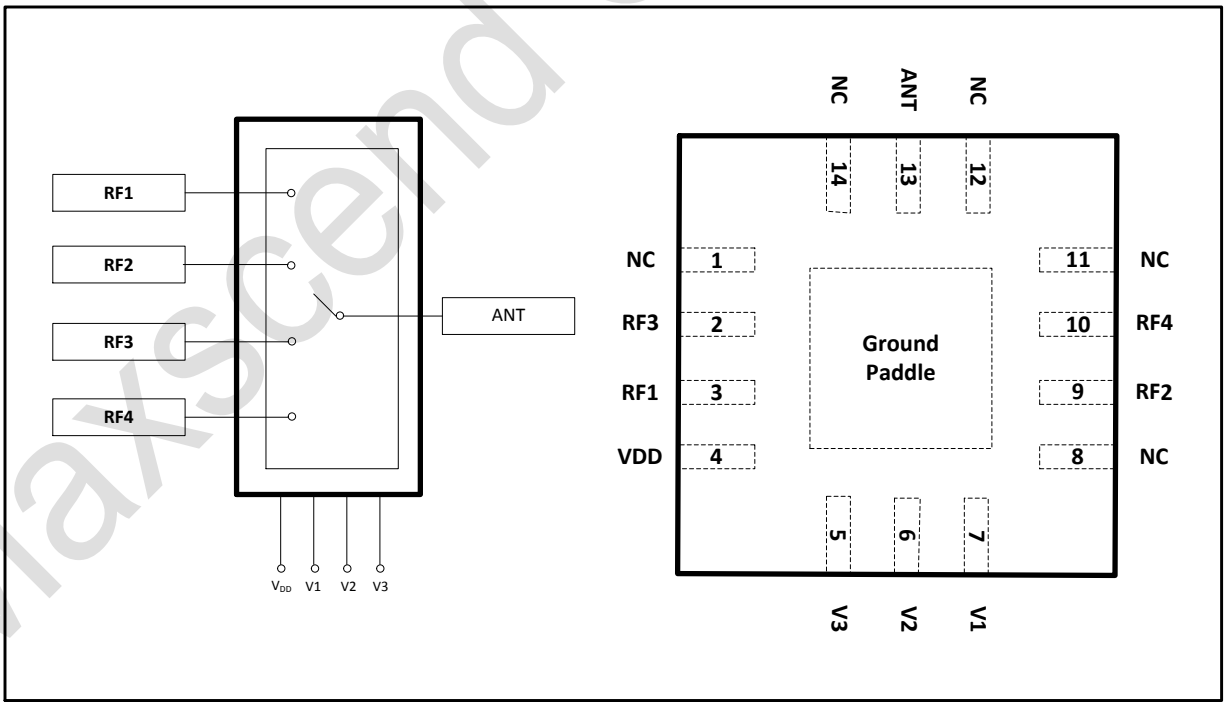

Figure 1 Functional Block Diagram and Pinout (Top View)

Application Circuit

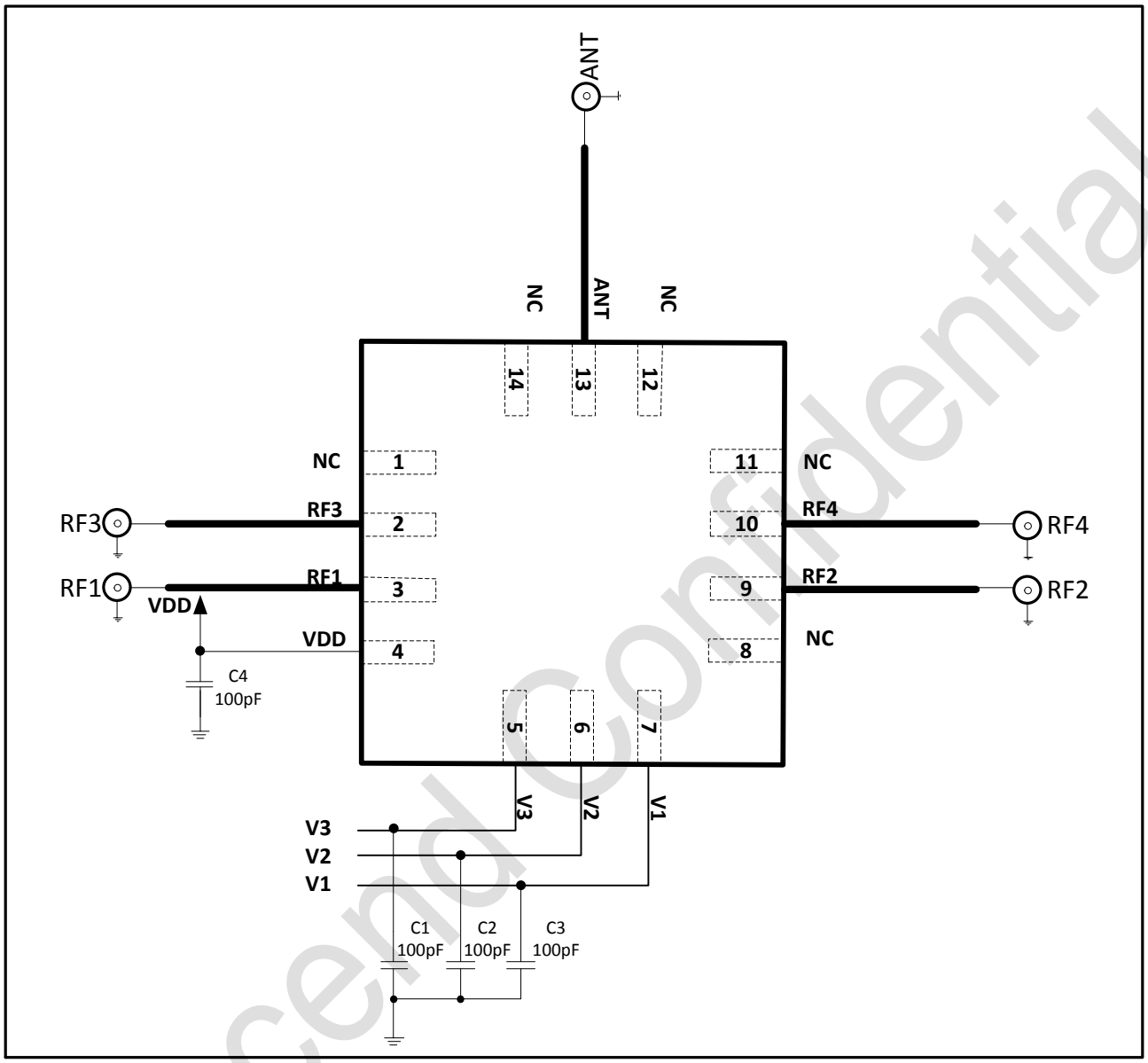

Figure 2 MXD8641 Evaluation Board Schematic

Table 1. Pin Description

Pin No.	Name	Description	Pin No.	Name	Description
1	NC	No connection	8	NC	No connection
2	RF3	RF port3	9	RF2	RF port2
3	RF1	RF port1	10	RF4	RF port4
4	V_{DD}	Power supply	11	NC	No connection
5	V3	Control logic 3#	12	NC	No connection
6	V2	Control logic 2#	13	ANT	Antenna port
7	V1	Control logic 1#	14	NC	No connection
Ground Paddle	GND	Ground			

Note: Bottom ground paddles must be connected to ground.

Truth Table

Table 2.

Control pins			Switched RF Outputs			
V1	**V2**	**V3**	**RF1**	**RF2**	**RF3**	**RF4**
0	0	0	**Insertion Loss**	Isolation	Isolation	Isolation
0	0	1	Isolation	**Insertion Loss**	Isolation	Isolation
0	1	0	Isolation	Isolation	**Insertion Loss**	Isolation
0	1	1	Isolation	Isolation	Isolation	**Insertion Loss**

Note: "1" = 1.0 V to 3.0 V. "0" = 0 V to 0.3 V.

Recommended Operation Range

Table 3. Recommended Operation Condition

Parameters	Symbol	Min	Typ	Max	Units
Operation Frequency	f1	0.1	-	3.0	GHz
Power supply	V_{DD}	2.5	2.8	3.0	V
Switch Control Voltage High	V_H	1.0	1.8	3.0	V
Switch Control Voltage Low	V_L	0	0	0.3	V

Specifications

Table 4. Electrical Specifications

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
DC Specifications						
Supply voltage	V_{DD}		2.5	2.8	3.0	V
Supply current	I_{DD}			40	60	μA
Control voltage: High Low	V_{CTL_H} V_{CTL_L}		1.0 0	1.8 0	3.0 0.3	V V
Control current	I_{CTL}	V_{CTL} = 1.8 V		0.5	1.0	μA
Switching Speed, on RF to another		10% to 90% RF		1	2	μs
Turn-on time	t_{on}	Power off state to any RF switch state		5	10	μs
RF Specifications						
Insertion loss (ANT pin to RF1/2/3/4 pins)	IL	0.1 to 1.0 GHz 1.0 to 2.0 GHz 2.0 to 2.7 GHz		0.20 0.25 0.40	0.25 0.30 0.50	dB dB dB
Isolation (ANT pin to RF1/2/3/4 pins)	Iso	0.1 to 1.0 GHz 1.0 to 2.0 GHz 2.0 to 2.7 GHz	35 28 22	40 33 25		dB dB dB
Input return loss (ANT pin to RF1/2/3/4 pins)	RL	0.1 to 1.0 GHz 1.0 to 2.0 GHz 2.0 to 2.7 GHz	20 18 15	25 22 20		dB dB dB
0.1 dB Compression Point (ANT pin to RF1/2/3/4 pins)	$P_{0.1dB}$	0.1 GHz to 3.0 GHz		27		dBm

Absolute Maximum Ratings

Table 5. Maximum ratings

Parameters	Symbol	Minimum	Maximum	Units
Supply voltage	V_{DD}	2.5	+3.3	V
Control voltage (V1, V2, and V3)	V_{CTL}	0	+3.0	V
RF input power (RF1 to RF4)	P_{IN}		+28	dBm
Operating temperature	T_{OP}	–20	+85	℃
Storage temperature	T_{STG}	–40	+125	℃
Electrostatic Discharge Human body model (HBM), Class 1C Machine Model (MM), Class A Charged device model (CDM), Class III	 ESD_HBM ESD_MM ESD_CDM		 1000 100 500	 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

Package Outline Dimension

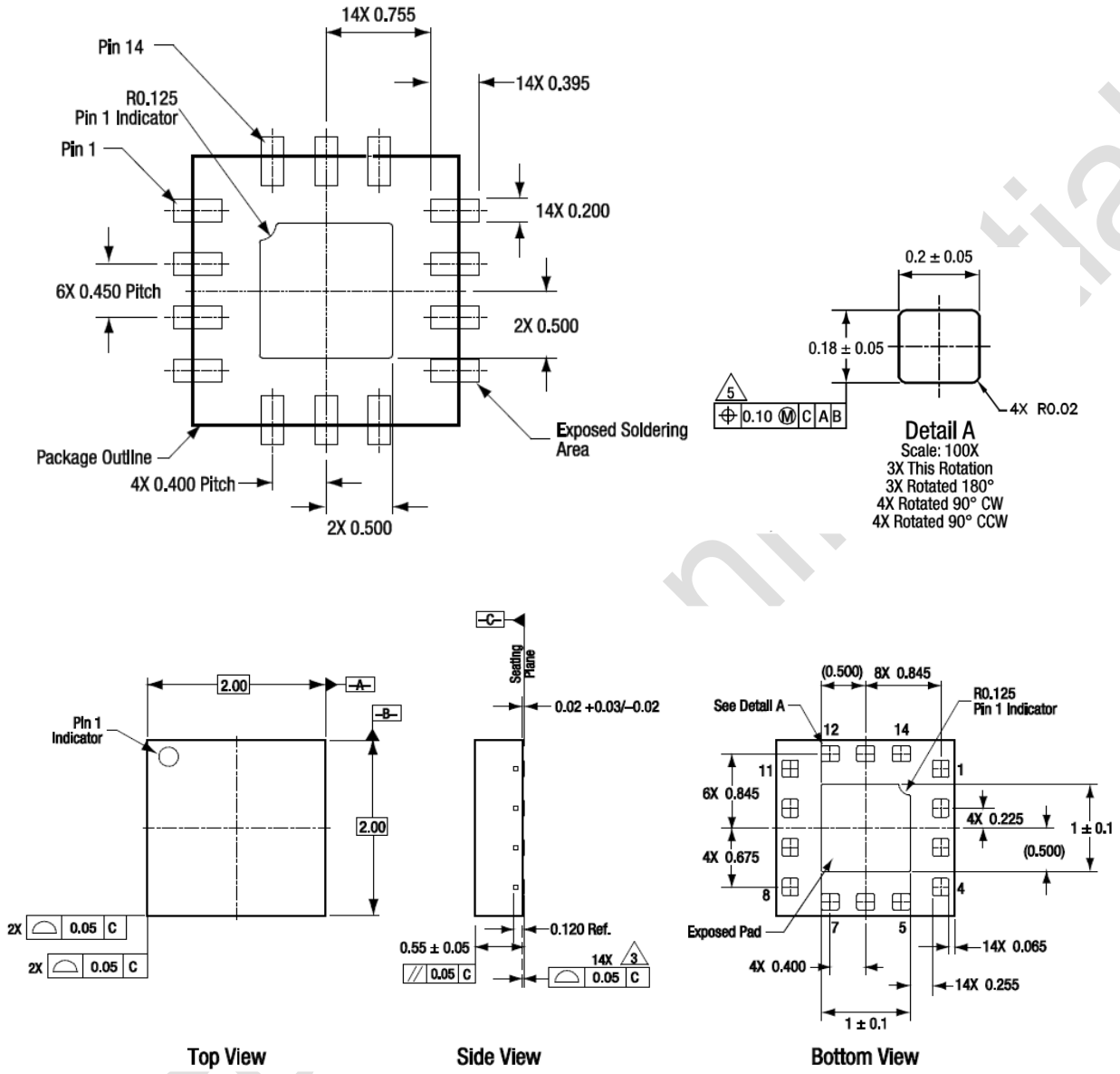

Figure 3 package outline dimension

Reflow Chart

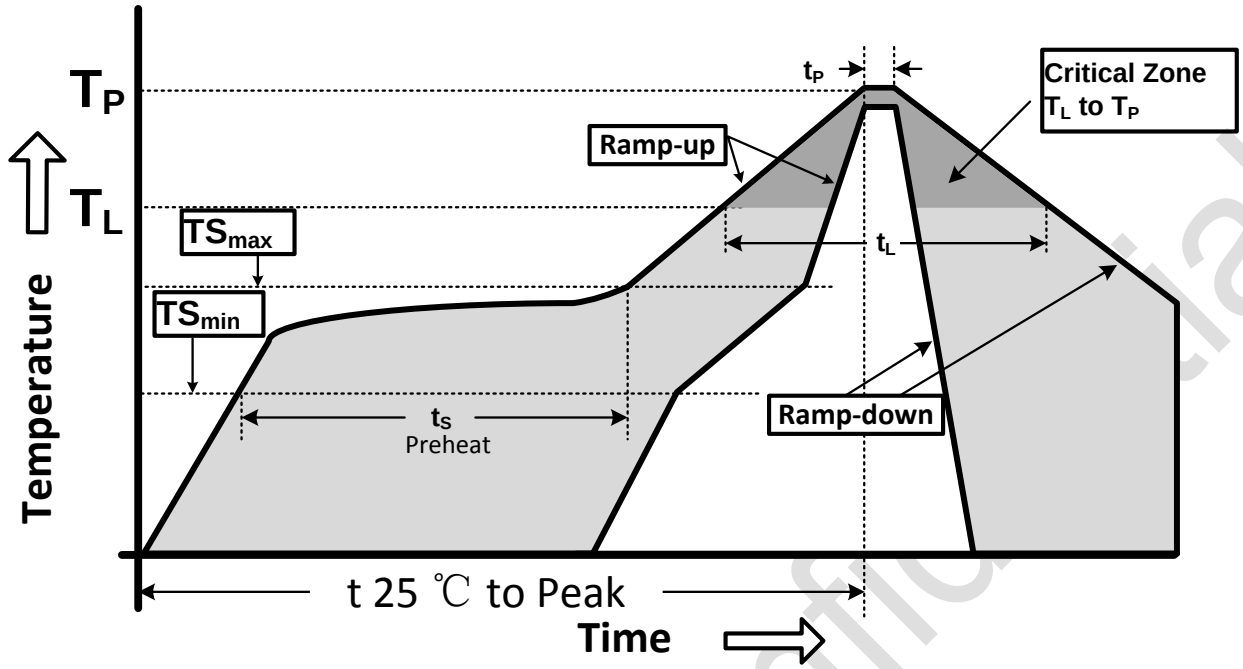

Figure 4 Recommended Lead-Free Reflow Profile

Table 6. Reflow condition

Profile Parameter	Lead-Free Assembly, Convection, IR/Convection
Ramp-up rate（TS_{max} to T_p）	3℃/second max.
Preheat temperature（TS_{min} to TS_{max}）	150℃ to 200℃
Preheat time（t_s）	60 - 180 seconds
Time above TL , 217℃（t_L）	60 - 150 seconds
Peak temperature（T_p）	260℃
Time within 5℃ of peak temperature(t_p)	20 - 40 seconds
Ramp-down rate	6℃/second max.
Time 25℃ to peak temperature	8 minutes max.

ESD Sensitivity

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

RoHS Compliant

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

1.3.2

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