MXD8651

SP5T Switch for Receive Diversity

QC
11

APPROVED

General Description

The MXD8651 is a low loss, high isolation SP5T switch with performance optimized for receive diversity routing applications.

The MXD8651 is compatible with +1.0V control logic, which is a key requirement for most cellular transceivers. This part is packaged in a compact 2mm x 2mm x 0.55 mm, 14-pin, QFN package which allows for a small solution size with no need for external DC blocking capacitors (when no external DC is applied to the device ports).

Features

● Excellent insertion loss and isolation performance
    - 0.5 dB Typical Insertion Loss, Band 7
    - 25 dB typical Isolation, Band 7
● Multi-Band operation 700MHz to 2700MHz
● GPIO compatible to 1.8V Typ (1.0V min)
● Power handling +30dBm
● Compact 2mm x 2mm x 0.55 mm, in QFN package , MSL1
● No DC blocking capacitors required (unless external DC is applied to the RF ports)

Applications

● Cellular Handset Applications
● Cellular modems and USB Devices
● Multi-mode GSM/Edge/WCDMA applications
● LTE applications

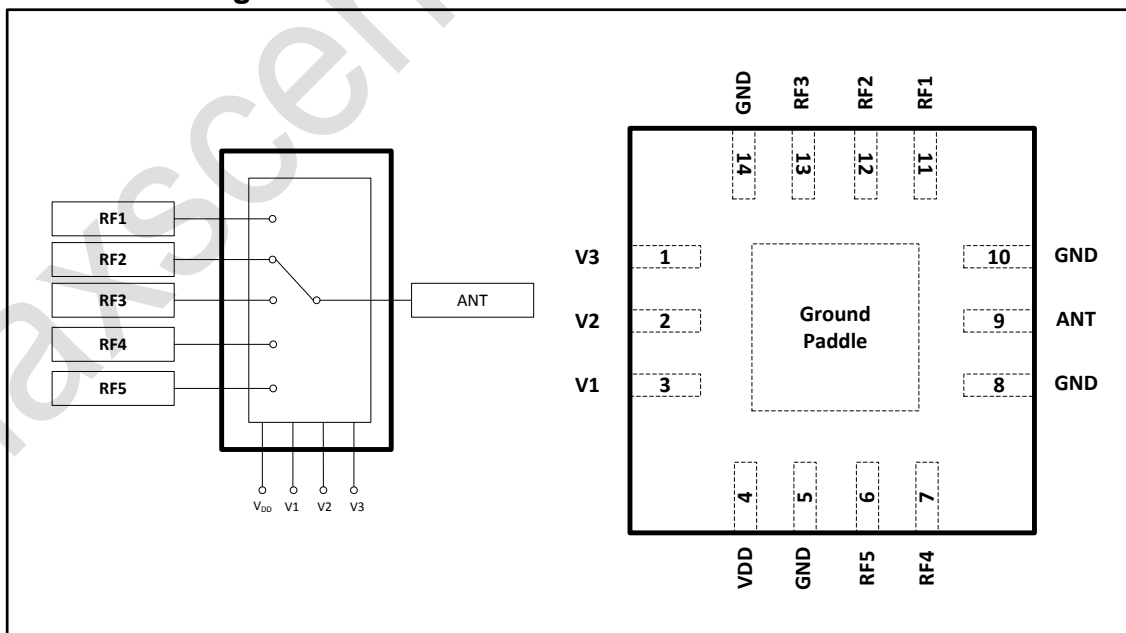## Functional Block Diagram and Pin Function

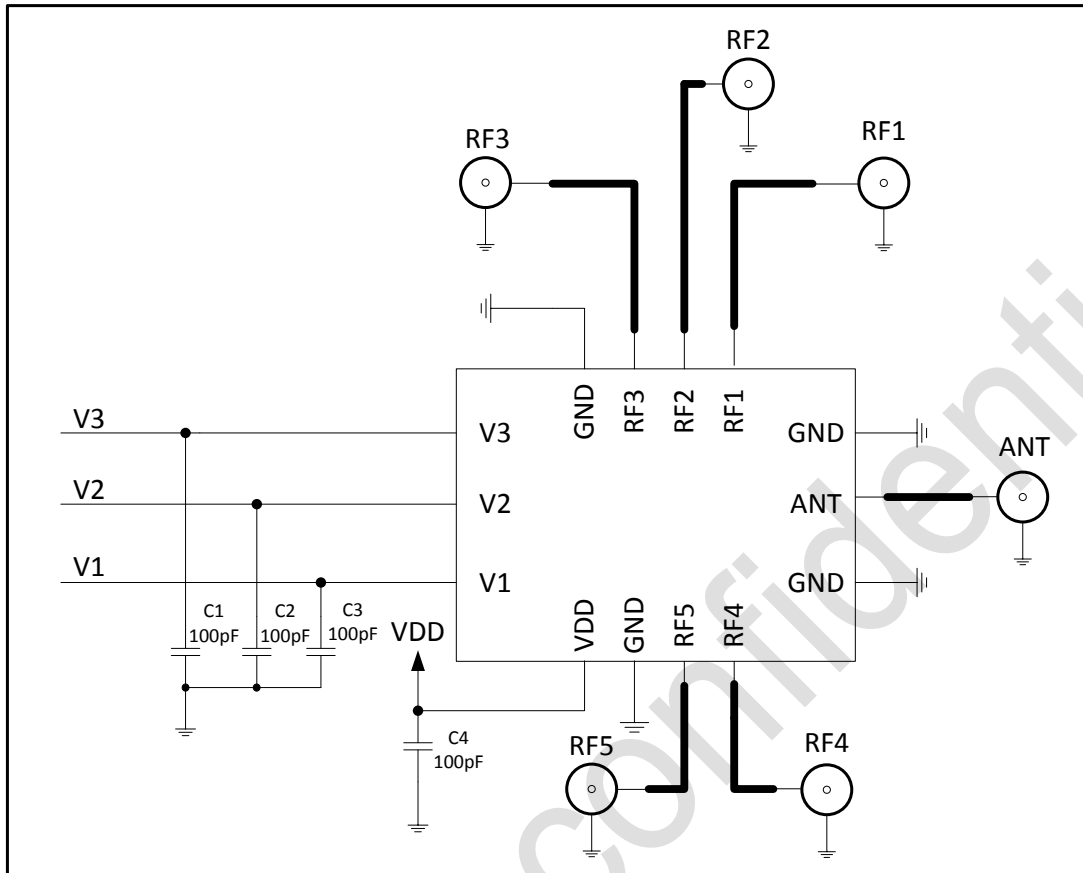Figure 1. Functional Block Diagram and Pinout (Top View)

Application Circuit

Figure 2. MXD8651 Evaluation Board Schematic

Table 1. Pin Description

Pin No.	Name	Description	Pin No.	Name	Description
1	V3	Control Logic #3	8	GND	Ground
2	V2	Control Logic #2	9	ANT	Antenna
3	V1	Control Logic #1	10	GND	Ground
4	V_{DD}	Power supply	11	RF1	RF port1
5	GND	Ground	12	RF2	RF port2
6	RF5	RF port5	13	RF3	RF port3
7	RF4	RF port4	14	GND	Ground
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	RF5
1	0	0	**Insertion Loss**	Isolation	Isolation	Isolation	Isolation
0	1	0	Isolation	**Insertion Loss**	Isolation	Isolation	Isolation
1	1	0	Isolation	Isolation	**Insertion Loss**	Isolation	Isolation
0	0	1	Isolation	Isolation	Isolation	**Insertion Loss**	Isolation
1	0	1	Isolation	Isolation	Isolation	Isolation	**Insertion Loss**

Note: "1" = 1.0 V to 3.0 V. "0" = 0 V to 0.3 V. Insertion loss in the V1/2/3 = 110 state is 3dB lower than typical insertion loss with only one arm "on".

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	3.3	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	Specification Min.	Specification Typical	Specification Max.	Units	Test Condition (Note 2)
DC Specifications						
Supply voltage	V_{DD}	2.5	2.8	3.3	V	
Supply current	I_{DD}		50	90	µA	Active mode
Control voltage: High Low	V_{CTL_H} V_{CTL_L}	1.0 0		3.0 0.3	V V	V_{DD} must be > V_{CTL} at all times
Control current	I_{CTL}			5	µA	
Switching Speed, on RF to another			2	5	µs	10% to 90% RF
Turn-on time	t_{on}		5	10	µs	Time from V_{DD}=0V to part ON and RF at 90%
RF Specifications						
Insertion Loss						
Insertion Loss TRx - ANT	IL		0.40 0.40 0.50 0.50 0.55		dB dB dB dB dB	704MHz to 787MHz 815MHz to 960MHz 1710MHz to 1980MHz 2110MHz to 2170MHz 2300MHz to 2690MHz
Isolation						
Isolated TRx ports - ANT	ISO	45 45 35 30 25			dB dB dB dB dB	704MHz to 787MHz 815MHz to 960MHz 1710MHz to 1980MHz 2110MHz to 2170MHz 2300MHz to 2690MHz
Harmonics (Pin =+16 dBm)						
Low Band, 2fo	2fo 3fo		-110		dBc	Pin = +16dBm, 50ohms, fo=824MHz
Low Band, 3fo			-105		dBc	Pin = +16dBm, 50ohms, fo=824MHz
High Band, 2fo			-105		dBc	Pin = +16dBm, 50ohms, fo=1980MHz
High Band, 3fo			-100		dBc	Pin = +16dBm, 50ohms, fo=1980MHz
High Band, 2fo			-100		dBc	Pin = +16dBm, 50ohms, fo=2570MHz
High Band, 3fo			-100		dBc	Pin = +16dBm, 50ohms, fo=2570MHz
VSWR			1.1	1.5		704-2690MHz

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 RF5)	P_{IN}		+30	dBm
Operating temperature	T_{OP}	−20	+85	℃
Storage temperature	T_{STG}	−40	+125	℃
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

Package Outline Dimension

DESCRIPTION	SYMBOL		MILLIMETER		
			MIN	NOM	MAX
TOTAL THICKNESS	A		0.50	0.55	0.60
STAND OFF	A1		0	―――	0.05
MOLD THICKNESS	A2		0.35	0.40	0.45
L/F THICKNESS	A3			0.152 REF	
LEAD WIDTH	b		0.13	0.18	0.23
BODY SIZE	D	X	1.95	2.00	2.05
	E	Y	1.95	2.00	2.05
LEAD PITCH	e			0.40 BSC	
EP SIZE	J	X	0.93	0.98	1.03
	K	Y	0.93	0.98	1.03
LEAD LENGTH	L		0.16	0.21	0.26
PACKAGE EDGE TOLERANCE	aaa			0.100	
MOLD FLATNESS	bbb			0.100	
COPLANARITY	ccc			0.080	
LEAD OFFSET	ddd			0.100	
EXPOSED PAD OFFSET	eee			0.100	

Figure 3. package outline dimension

Marking Specification

Product Code(Fixed)：
8651

8651
ABCD

Manufacture Code(Variable):
From 1~9 and A ~Z
excluding letter "I" and "O"
for lot tracking

Pin 1

Figure 4. Marking specification (Top View)

Tape and Reel Dimensions

Ao	2.25 +/−0.1
Bo	2.25 +/−0.1
Ko	0.75 +/−0.1
F	3.50 +/−0.1
P1	4.00 +/−0.1
W	8.00 +/−0.3

(I)   Measured from centreline of sprocket hole to centreline of pocket.
(II) Cumulative tolerance of 10 sprocket holes is ± 0.20 .
(III) Measured from centreline of sprocket hole to centreline of pocket.
(IV) Other material available.

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.
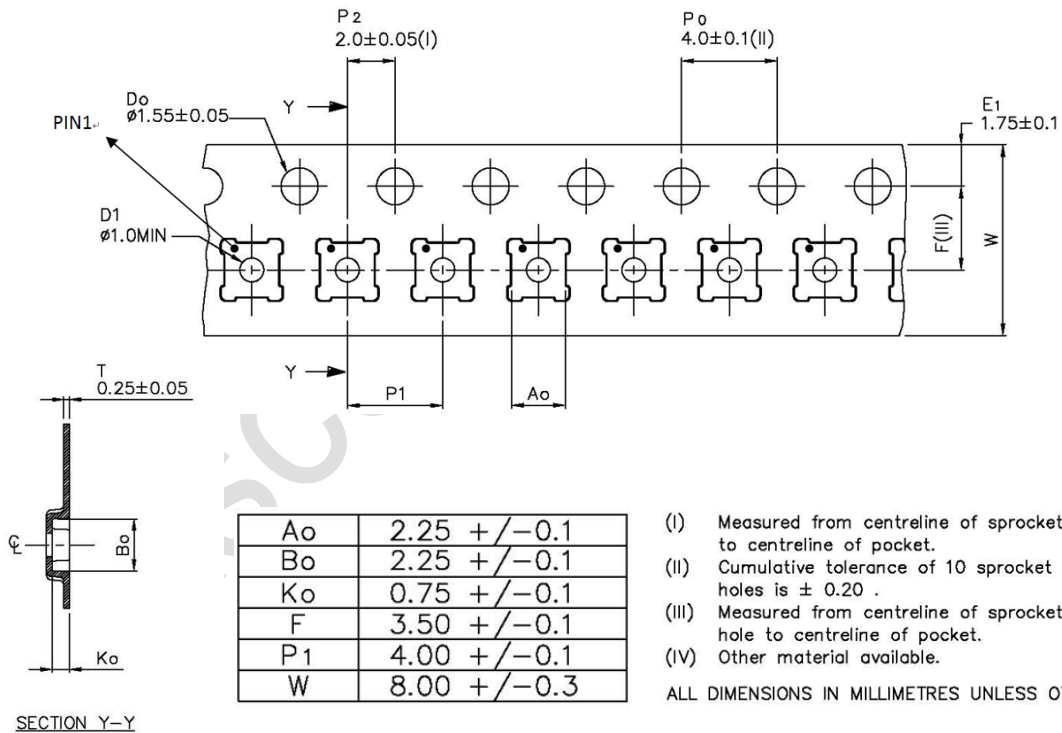
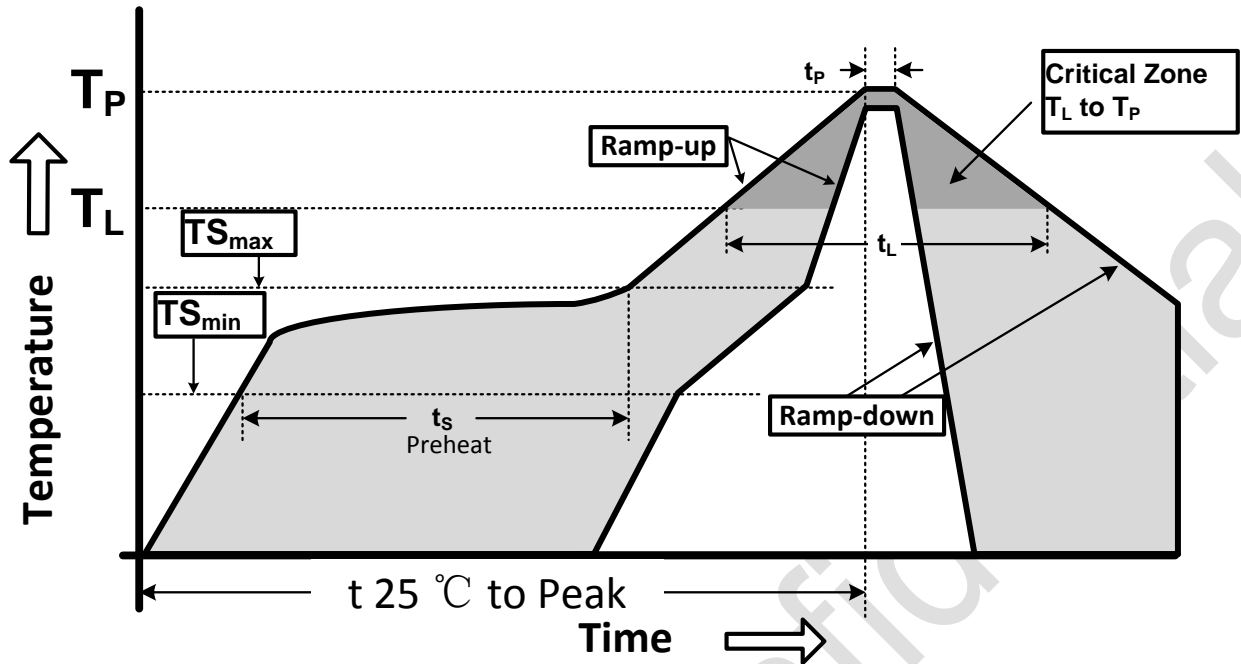**Figure 5. Tape and reel dimensions**

Reflow Chart

Figure 6. 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.