# MXD8529

0.1-3.0GHz SPDT Antenna Tuning Switch

## General Description

The MXD8529 is a CMOS silicon-on-insulator (SOI), single-pole, double-throw (SPDT) 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 MXD8529 SPDT switch is provided in a compact 1.385mm x 1.485mm x 0.45mm 8-lead LGA 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.

## Applications

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

## Features

- Broadband frequency range: 0.1 to 3.0 GHz
- Low insertion 0.30dB @ 2.7 GHz
- High P0.1dB of 38dBm
- Positive low voltage control: VC = 1.0 to 3.0 V, VDD = 2.5 to 3.0 V, Small, LGA (8-pin, 1.385mm x 1.485mm x 0.45mm) package

## Functional Block Diagram and Pin Function

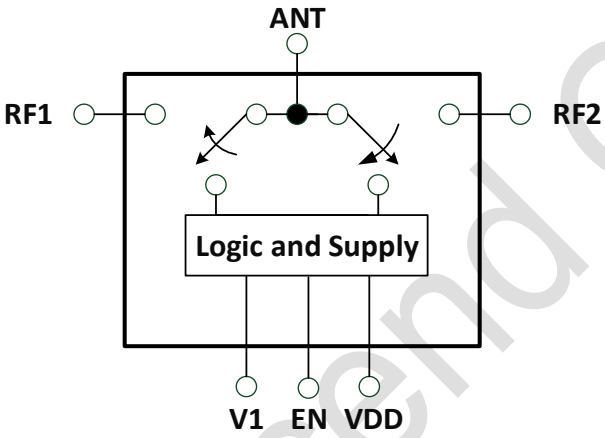



Figure 1.Functional Block Diagram

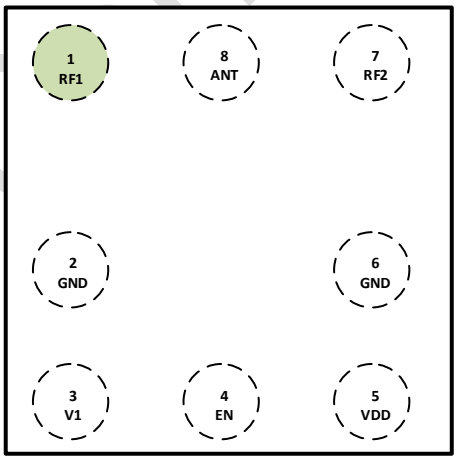



Figure 2.Pin-out (Top View)

## Application Circuit

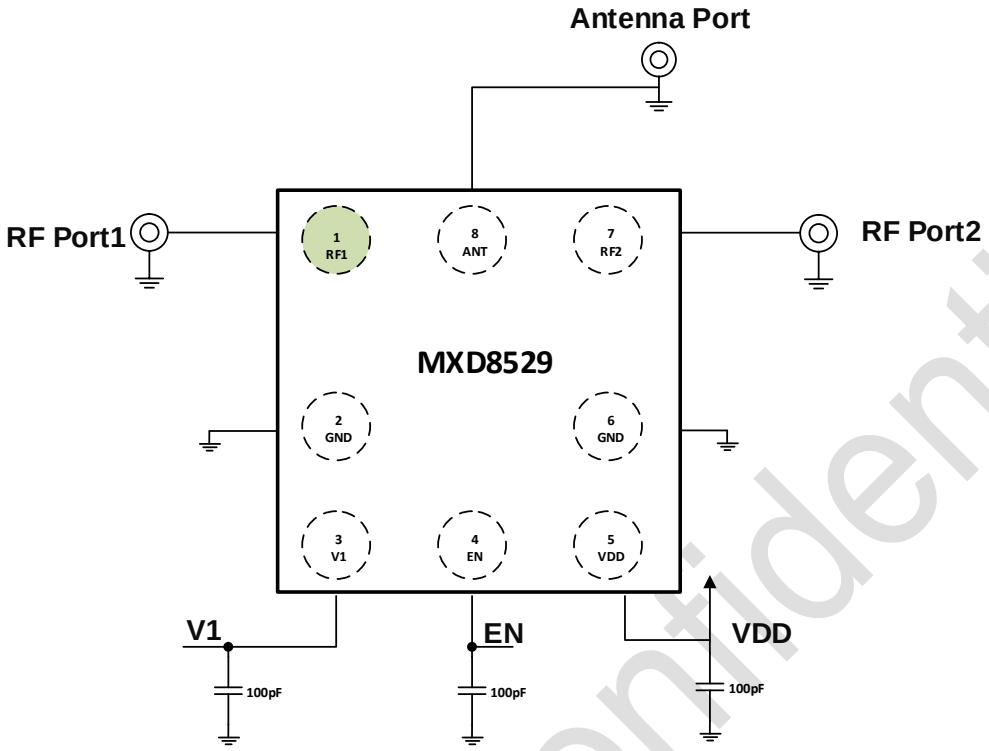



**Figure 3. MXD8529 Application Circuit**

**Table 1. Pin Description**

| Pin No. | Name | Description | Pin No. | Name | Description |
|---|---|---|---|---|---|
| 1 | RF1 | RF port 1 | 5 | VDD | DC power supply |
| 2 | GND | Ground | 6 | GND | Ground |
| 3 | V1 | DC control voltage | 7 | RF2 | RF port 2 |
| 4 | EN | DC control voltage | 8 | ANT | Antenna port |

## Truth Table

**Table 2.**

| Active Path | EN | V1 |
|---|---|---|
| ANT to RF1 | 1 | 0 |
| ANT to RF2 | 1 | 1 |
| OFF | 0 | 1 |
| Low Power Mode | 0 | 0 |

**Note:** "1" = 1.0 V to 3.00 V. "0" = –0 V to +0.3 V.

## Recommended Operation Range

**Table 3.**

| 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 | $V_{CTL\_H}$ | 1.0 | 1.8 | 3.0 | V |
| Switch Control Voltage Low | $V_{CTL\_L}$ | 0 | 0 | 0.3 | V |

## Specifications

### Table 4.Electrical Specifications

| Parameter | Symbol | Specification | | | Units | Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typical | Max. | | |
| **DC Specifications** | | | | | | |
| Control voltage:<br>Low<br>High | <br>$V_{CTL\_L}$<br>$V_{CTL\_H}$ | <br>0<br>1.0 | <br>0<br>1.8 | <br>0.3<br>3.0 | <br>V<br>V | |
| Supply voltage | $V_{DD}$ | 2.5 | 2.8 | 3.0 | V | |
| Supply current | $I_{DD}$ | | 35 | | μA | $V_{DD}$ = 2.8 V |
| Control current | $I_{CTL}$ | | 1 | | μA | $V_{CTL}$= 1.8 V |
| **RF Specifications** | | | | | | |
| Insertion loss | IL | | 0.20<br>0.25<br>0.30 | | dB<br>dB<br>dB | 0.8 to 1.0 GHz<br>1.0 to 2.2 GHz<br>2.2 to 3.0 GHz |
| Isolation | ISO | 25<br>20<br>15 | 30<br>22<br>17 | | dB<br>dB<br>dB | 0.8 to 1.0 GHz<br>1.0 to 2.2 GHz<br>2.2 to 3.0 GHz |
| Return loss | $\|S_{11}\|$ | | 22 | | dB | 0.8 to 3.0 GHz |
| Input 0.1 dB compression point | $P_{0.1dB}$ | | +38 | | dBm | 0.8 to 3.0 GHz,<br>ANT to RF1 and RF2 |
| Maximum RF operating voltage | $V_{PK}$ | | 36 | | V | 25% duty cycle, OFF state,<br>0.8 to 3.0 GHz |
| On Resistance (RF1/2 to ANT) | Ron | | 1.25 | 1.35 | Ω | Switch on Path |
| OFF Capacitance (RF1/2 to ANT) | Coff | | 170 | 190 | fF | Switch off Path |
| Off Resistance (RF1/2 to ANT) | RoffRF | | 58 | | kΩ | Switch off Path |
| Switching on time | | | 2 | | μs | 50% VCTL to 90% RF |
| Switching off time | | | 2 | | μs | 50% VCTL to 10% RF |
| Startup time | | | 3 | | μs | Power off state to any RF switch state |

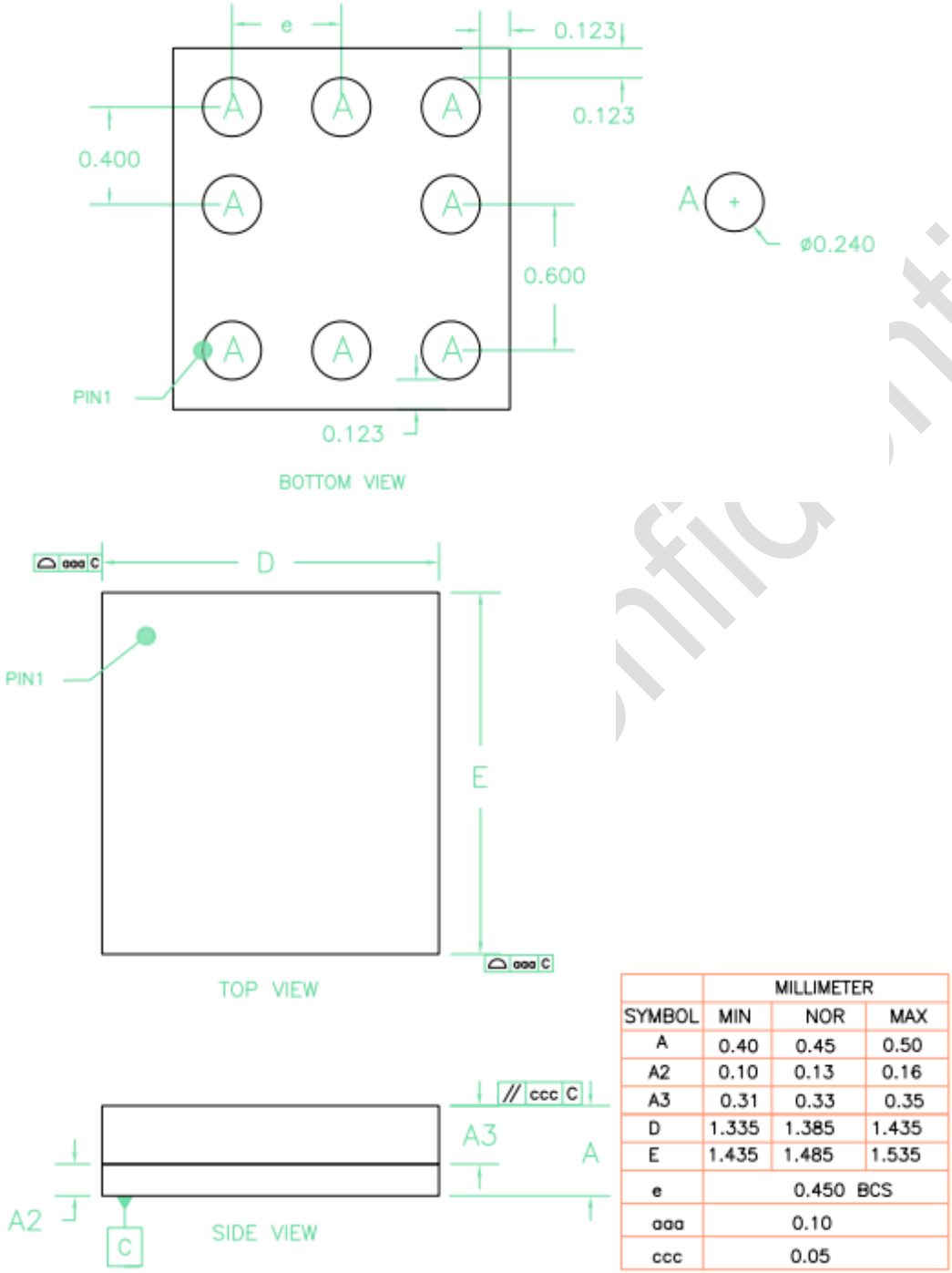
## Absolute Maximum Ratings

### Table 5. Maximum ratings

| Parameters | Symbol | Minimum | Maximum | Units |
|---|---|---|---|---|
| Supply voltage | $V_{DD}$ | +2.5 | +3.3 | V |
| Digital control voltage | $V_{CTL}$ | 0 | +3.0 | V |
| RF input power | $P_{IN}$ | | +41 | dBm |
| Operating temperature | $T_{OP}$ | –30 | +85 | ℃ |
| Storage temperature | $T_{STG}$ | –55 | +150 | ℃ |
| Peak RF operation voltage, 25% duty cycle, OFF state, f=700MHz to 2690MHz, $V_{DD}$ =2.8V, $V_{CTL}$ =1.8V | $V_{RFPEAK}$ | | 41 | V |
| Electrostatic Discharge<br>Human body model (HBM), Class 1C<br>Machine Model (MM), Class A<br>Charged device model (CDM), Class III | <br>ESD_HBM<br>ESD_MM<br>ESD_CDM | | <br>1000<br>100<br>500 | <br><br>V<br> |

**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




| | MILLIMETER | | |
|---|---|---|---|
| SYMBOL | MIN | NOR | MAX |
| A | 0.40 | 0.45 | 0.50 |
| A2 | 0.10 | 0.13 | 0.16 |
| A3 | 0.31 | 0.33 | 0.35 |
| D | 1.335 | 1.385 | 1.435 |
| E | 1.435 | 1.485 | 1.535 |
| e | 0.450 BCS | | |
| aaa | 0.10 | | |
| ccc | 0.05 | | |

**Figure 4. Package outline dimension**

## Reflow Chart

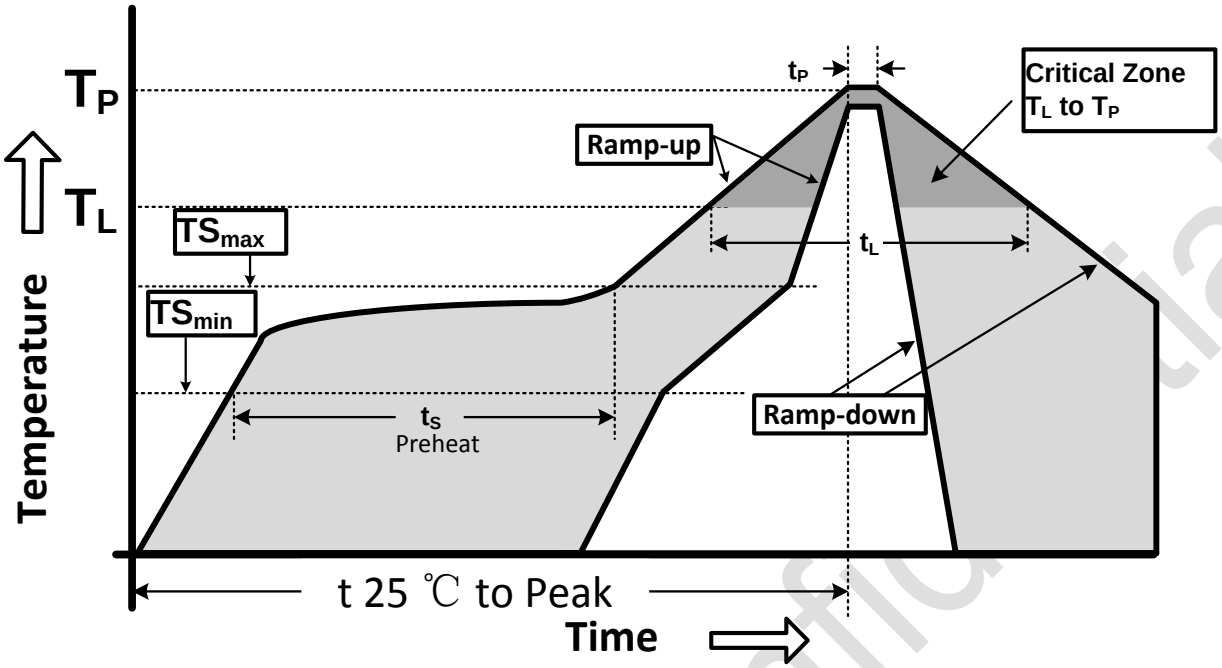



**Figure 5. Recommended Lead-Free Reflow Profile**

**Table 6.**

| 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.

1.2.1

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