



## MXD8631

0.1-3.0GHz SP3T Switch



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## General Description

The MXD8631 is a CMOS silicon-on-insulator (SOI), single-pole, triple-throw (SP3T) receive switch. The high linearity performance and low insertion loss makes the device an ideal choice for GSM/WCDMA/LTE handset and data card applications.

The MXD8631 SP3T switch is provided in a compact Quad Flat No-Lead (QFN) 1.15mm x 1.15mm x 0.55mm 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.

## Functional Block Diagram and Pin Function

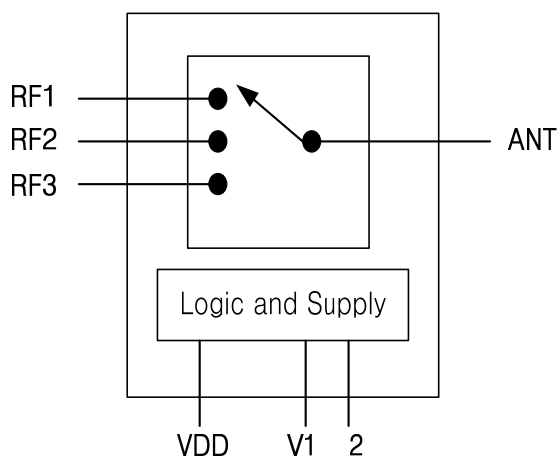


Figure 1. Functional Block Diagram

## Applications

- GSM/WCDMA/LTE receive
- 802.11a/b/g/n WLANs

## Features

- Broadband frequency range: 0.1 to 3.0 GHz
- Low insertion: 0.50 dB @ 2.7 GHz
- High isolation: 25 dB up to 2.7 GHz
- No external DC blocking capacitors required
- Positive low voltage control: VC = 1.6 to 3.00 V, VDD = 2.5 to 3.0 V
- Small, QFN (9-pin, 1.15mm x 1.15mm x 0.55mm) package

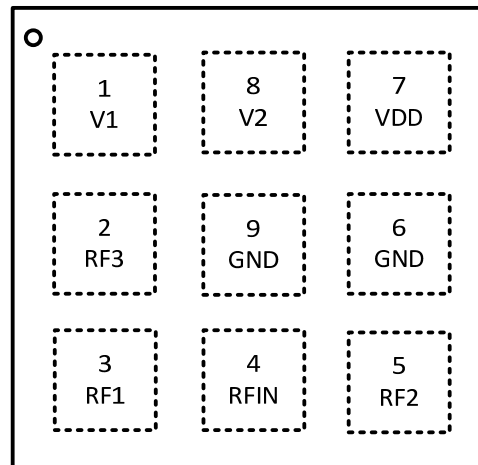


Figure 2. Pin-out (Top View)

## Application Circuit

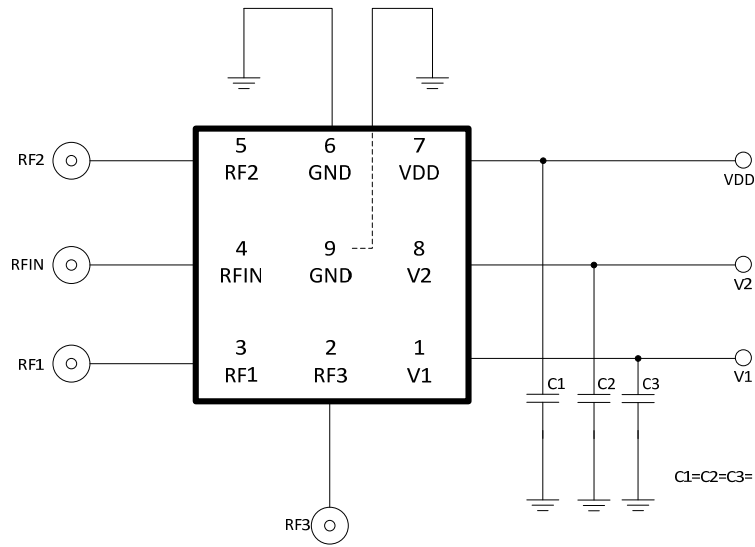


Figure 3. MXD8631 Application Circuit

Table 1. Pin Description

| Pin No. | Name | Description   | Pin No. | Name | Description   |
|---------|------|---------------|---------|------|---------------|
| 1       | V1   | Control Pin 1 | 6       | GND  | Ground        |
| 2       | RF3  | RF-Port 3     | 7       | VDD  | Power Supply  |
| 3       | RF1  | RF-Port 1     | 8       | V2   | Control Pin 2 |
| 4       | RFin | RF Input      | 9       | GND  | Ground        |
| 5       | RF2  | RF-Port 2     |         |      |               |

## Truth Table

Table 2.

| V1 | V2 | Active Path |
|----|----|-------------|
| 0  | 0  | OFF         |
| 1  | 0  | ANT to RF1  |
| 0  | 1  | ANT to RF2  |
| 1  | 1  | ANT to RF3  |

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 <sub>DD</sub>    | 2.5 | 2.8 | 3.0 | V     |
| Switch Control Voltage High | V <sub>CTL H</sub> | 1.6 | 1.8 | 3.0 | V     |
| Switch Control Voltage Low  | V <sub>CTL L</sub> | 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         | $V_{CTL\_L}$<br>$V_{CTL\_H}$ | 0             | +1.8    | 0.3  | V     |                                                      |
| High                            |                              | 1.60          |         | 3.00 | V     |                                                      |
| Supply voltage                  | $V_{DD}$                     | 2.5           | 2.8     | 3.0  | V     |                                                      |
| Supply current                  | IDD                          |               | 20      |      | uA    | VDD = 2.8 V                                          |
| Control current                 | Ictl                         |               | 1       |      | uA    | VC= 1.8 V                                            |
| RF Specifications               |                              |               |         |      |       |                                                      |
| Insertion loss                  | IL                           |               | 0.30    | 0.40 | dB    | 0.8 to 1.0 GHz                                       |
|                                 |                              |               | 0.40    | 0.50 | dB    | 1.0 to 2.2 GHz                                       |
|                                 |                              |               | 0.50    | 0.60 | dB    | 2.2 to 3.0 GHz                                       |
| Isolation                       | ISO                          | 30            | 35      |      | dB    | 0.8 to 1.0 GHz                                       |
|                                 |                              | 24            | 28      |      | dB    | 1.0 to 2.2 GHz                                       |
|                                 |                              | 20            | 24      |      | dB    | 2.2 to 3.0 GHz                                       |
| Return loss                     | S11                          |               | 15      |      | dB    | 0.8 to 3.0 GHz                                       |
| 3rd Order Input Intercept Point | IIP3                         | +60           | +70     |      | dBm   | 0.8 to 3.0 GHz,<br>ΔF = 1 MHz,<br>PIN = +20 dBm/tone |
| Input 0.1 dB compression point  | P0.1dB                       |               | +29     |      | dBm   | 0.8 to 3.0 GHz                                       |
| 2nd harmonic                    | 2fo                          |               | +83     |      | dBc   | 0.8~3GMHz,<br>PIN = +26 dBm                          |
| 3rd harmonic                    | 3fo                          |               | +70     |      | dBc   | 0.8~3GMHz,<br>PIN = +26 dBm                          |
| Switching on time               |                              |               | 100     |      | ns    | 50% VCTL to 10/90% RF                                |
| Switching off time              |                              |               | 100     |      | ns    | 50% VCTL to 90/10% RF                                |
| Startup time                    |                              |               | 300     |      | ns    | Shutdown state to any RF switch state                |

## Absolute Maximum Ratings

Table 5. Maximum ratings

| Parameters                                                                                  | Symbol    | Minimum | Maximum     | Units  |
|---------------------------------------------------------------------------------------------|-----------|---------|-------------|--------|
| Supply voltage                                                                              | $V_{DD}$  | +2.5    | +3.0        | V      |
| Digital control voltage                                                                     | $V_{CTL}$ | 0       | +3.0        | V      |
| RF input power                                                                              | $P_{IN}$  |         | +29         | dBm    |
| Operating temperature                                                                       | $T_{OP}$  | -30     | +85         | °C     |
| Storage temperature                                                                         | $T_{STG}$ | -55     | +150        | °C     |
| Electrostatic discharge:<br>Human Body Model (HBM), Class 1C<br>Machine Model (MM), Class A | ESD       |         | 2000<br>100 | V<br>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

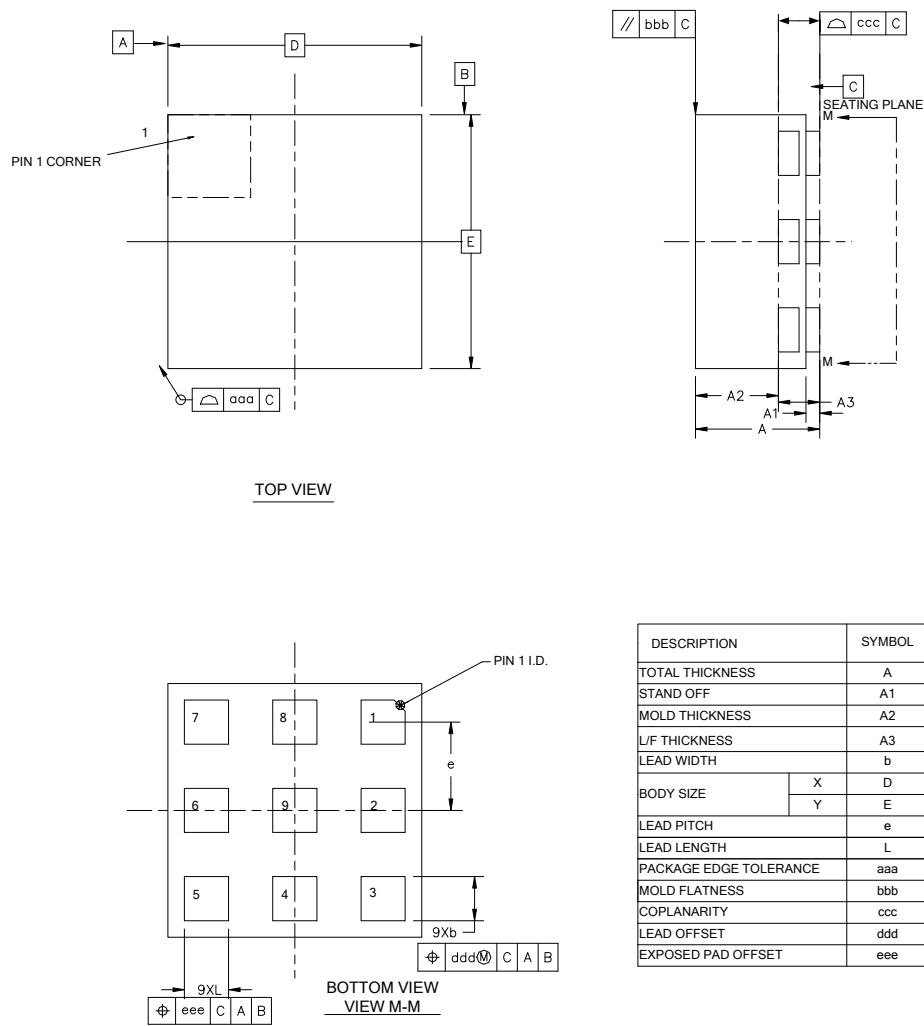
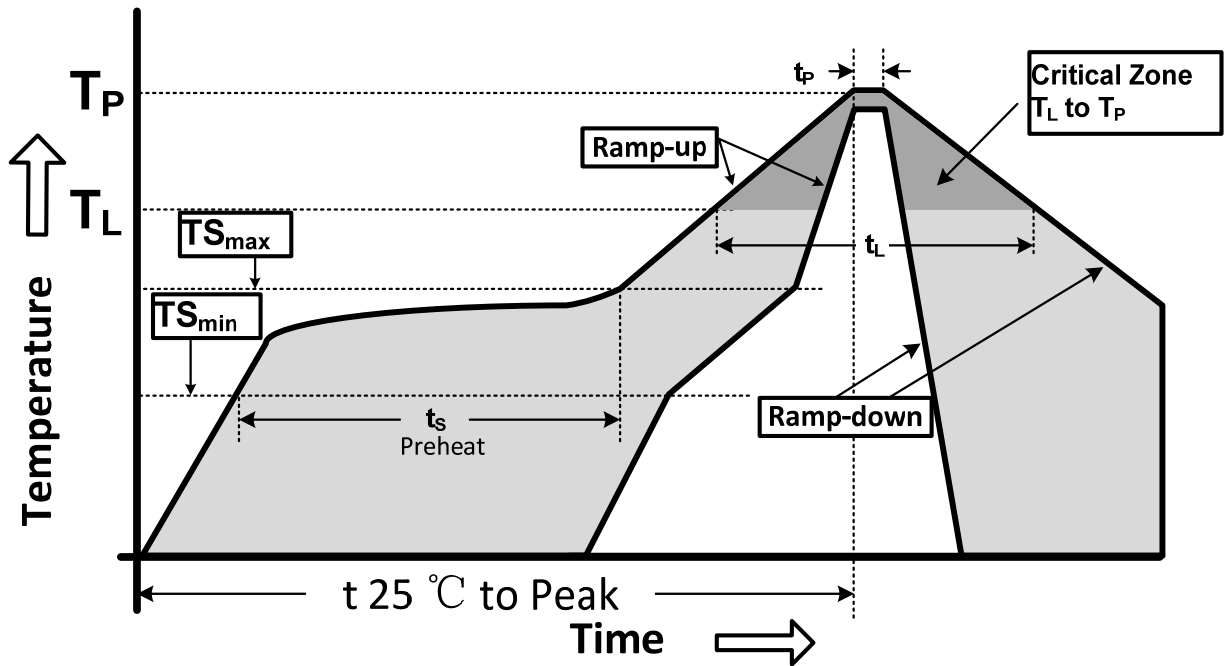


Figure 4. Package outline dimension

## Reflow Chart



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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°C/second max.                               |
| Preheat temperature ( $TS_{min}$ to $TS_{max}$ ) | 150°C to 200°C                                |
| Preheat time ( $t_s$ )                           | 60 - 180 seconds                              |
| Time above $T_L$ , 217°C ( $t_L$ )               | 60 - 150 seconds                              |
| Peak temperature ( $T_P$ )                       | 260°C                                         |
| Time within 5°C of peak temperature( $t_p$ )     | 20 - 40 seconds                               |
| Ramp-down rate                                   | 6°C/second max.                               |
| Time 25°C 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.