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## CAN1326 SP4T Switch

## Product Datasheet

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## CAN1326

## Single Pole Four Throw Switch

## General Description

The CAN1326 is a single-pole, four-throw (SP4T) switch. No external DC blocking capacitors are required on the RF paths as long as there is no DC voltage on the RF line. The switch can operate over the temperature range of $-40^{\circ} \mathrm{C}$ to $+85^{\circ} \mathrm{C}$.

Switching is controlled by two logical control voltage inputs (VC1 and VC2). Depending on the logic voltage level applied to the control pin, the RFC pin is connected to one of the four switched RF outputs (RF1, RF2, RF3, or RF4) by using a low insertion loss path, while the path between the RFC pin and the other RF pins is in isolation.


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Package

- QFN 9-pin
- $1.1 \mathrm{~mm} \times 1.1 \mathrm{~mm} \times 0.55 \mathrm{~mm}$


## Features

- Broadband Frequency Range: 0.1 GHz to 2.7 GHz
- Low Insertion Loss: 0.61 dB typical @ 2.7 GHz
- High Isolation: 23dB typical @ 2.7 GHz
- Integrated GPIO Interface.
- No DC Blocking Capacitors Required.
- Lead (Pb)-free and RoHS-compliant.
- Small Size.


## Applications

- NB-IOT Applications
- Cellular Systems.
- 3G/4G LTE Systems.
- Pre- and Post- PA Switching.


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Absolute Maximum Ratings

| Parameter | Symbol | Rating | Unit | Condition |
| :--- | :---: | :---: | :---: | :---: |
| Supply Voltage | $\mathrm{V}_{\mathrm{DD}}$ | 2.5 to 5.0 | V | $\mathrm{~T}=25{ }^{\circ} \mathrm{C}$ |
| Control Voltage | V CTL | 0 to 3.3 | V | $\mathrm{~T}=25{ }^{\circ} \mathrm{C}, \quad \mathrm{V}$ CTL $<=\mathrm{VDD}$ |
| RF Input Power | PIN | +35.4 | dBm | Peak power at RFC port, <br> $\mathrm{T}=25{ }^{\circ} \mathrm{C} ; 50 \Omega$ |
| Operating Temperature | TOP | -40 to +85 | ${ }^{\circ}{ }^{\circ} \mathrm{C}$ |  |
| Storage Temperature | $\mathrm{T}_{\text {STG }}$ | -55 to +150 | ${ }^{\circ}{ }^{\circ} \mathrm{C}$ |  |

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.

CAUTION: Although this device is designed to be as robust as possible, Electrostatic Discharge (ESD) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions should be used at all times.

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Electrical Specifications

| Parameter | Symbol | Specification |  |  | Unit | Conditions |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Min | Typ | Max |  |  |
| $\mathrm{V}_{\mathrm{DD}}=2.85 \mathrm{~V}, \mathrm{VC1} / \mathrm{VC2}=0 / 1.65$ to 3.0 V , $\mathrm{ToP}=+25^{\circ} \mathrm{C}, \mathrm{P}_{\mathrm{IN}}=0 \mathrm{dBm}$, Characteristic Impedance $\left[\mathrm{Z}_{0}\right]=50 \Omega$, Unless Otherwise Noted . |  |  |  |  |  |  |
| Small Signal |  |  |  |  |  |  |
| Insertion loss (RFC to RF1-RF4) | IL |  | 0.45 | 0.55 | dB | $0.10 \sim 0.70 \mathrm{GHz}$ |
|  |  |  | 0.49 | 0.60 | dB | $0.70 \sim 0.96 \mathrm{GHz}$ |
|  |  |  | 0.57 | 0.70 | dB | $1.71 \sim 2.17 \mathrm{GHz}$ |
|  |  |  | 0.61 | 0.80 | dB | $2.17 \sim 2.69 \mathrm{GHz}$ |
| Isolation (RFC to RF1-RF4) | Iso |  | 38 |  | dB | $0.50 \sim 0.70 \mathrm{GHz}$ |
|  |  |  | 35 |  | dB | $0.7 \sim 0.96 \mathrm{GHz}$ |
|  |  |  | 26 |  | dB | $1.71 \sim 2.17 \mathrm{GHz}$ |
|  |  |  | 23 |  | dB | $2.17 \sim 2.69 \mathrm{GHz}$ |
| Return Loss | RL |  | 30 |  | dB | $0.50 \sim 0.70 \mathrm{GHz}$ |
|  |  |  | 28 |  | dB | $0.7 \sim 0.96 \mathrm{GHz}$ |
|  |  |  | 25 |  | dB | 1.71 ~ 2.17 GHz |
|  |  |  | 27 |  | dB | $2.17 \sim 2.69 \mathrm{GHz}$ |
| 0.1 dB Compression Point | P0.1dB |  | 32.4 |  | dBm | 0.10 ~ 2.7 GHz |
| Large Signal |  |  |  |  |  |  |
| LTE/WCDMA Harmonic Low Band (RFC to RF1-RF4) | 2fo |  |  | -67 | dBm | $\mathrm{fo}=824$ to $960 \mathrm{MHz}, \mathrm{Pin}^{\text {a }}=+26 \mathrm{dBm}, \mathrm{VSWR}=1: 1$ |
|  | 3 fo |  |  | -40 | dBm |  |
|  | 2fo |  |  | -65 | dBm | $\mathrm{fo}=824$ to 960 MHz, Pin $=+26 \mathrm{dBm}, \mathrm{VSWR}=6: 1$ |
|  | 3fo |  |  | -40 | dBm |  |
| LTE/WCDMA Harmonic Mid Band (RFC to RF1-RF4) | 2 ¢о |  |  | -75 | dBm | fo =1710 to $1910 \mathrm{MHz}, \mathrm{PIN}=+26 \mathrm{dBm}, \mathrm{VSWR}=1: 1$ |
|  | 3fo |  |  | -52 | dBm |  |
|  | 2fo |  |  | -70 | dBm | fo $=1710$ to $1910 \mathrm{MHz}, \mathrm{P}_{\text {IN }}=+26 \mathrm{dBm}, \mathrm{VSWR}=6: 1$ |
|  | 3 fo |  |  | -50 | dBm |  |
| LTE/WCDMA Harmonic High Band (RFC to RF1-RF4) | 2 2o |  |  | -75 | dBm | $\mathrm{fo}=2690 \mathrm{MHz}$, Pin $=+26 \mathrm{dBm}, \mathrm{VSWR}=1: 1$ |
|  | 3fo |  |  | -52 | dBm |  |
|  | 2 2o |  |  | -70 | dBm | $\mathrm{fo}=2690 \mathrm{MHz}$, Pin $=+26 \mathrm{dBm}, \mathrm{VSWR}=6: 1$ |
|  | 3fo |  |  | -50 | dBm |  |
| Band $173^{\text {rd }}$ Harmonic (RFC to RF1-RF4) | B17 3fo |  | -90 | -80 | dBm | fo $=716 \mathrm{MHz}, \mathrm{PIN}=+25 \mathrm{dBm}, \mathrm{VSWR}=1: 1$ |
|  |  |  |  | -75 | dBm | $\mathrm{fo}=716 \mathrm{MHz}, \mathrm{PIN}=+25 \mathrm{dBm}, \mathrm{VSWR}=6: 1$ |
| Band $172^{\text {nd }}$ Harmonic (RFC to RF1-RF4) | B13 2fo |  | -105 | -100 | dBm | $\mathrm{fo}=787 \mathrm{MHz}, \mathrm{PIN}=+25 \mathrm{dBm}, \mathrm{VSWR}=1: 1$ |
|  |  |  |  | -90 | dBm | fo $=787 \mathrm{MHz}, \mathrm{PIN}=+25 \mathrm{dBm}, \mathrm{VSWR}=6: 1$ |
| DC Operating |  |  |  |  |  |  |
| Supply Voltage | $\mathrm{V}_{\mathrm{DD}}$ | 2.5 | 2.85 | 4.5 | V |  |
| Control Voltage | VCTL_H | 1.65 | 1.8 | 3.0 | V |  |
|  | $\mathrm{V}_{\text {cti_L }}$ |  | 0 | 0.35 | V |  |
| Supply Current (active) | ldo |  | 60 |  | $\mu \mathrm{A}$ | Supply Current (any active state), $\mathrm{V}_{\text {DD }}=2.85 \mathrm{~V}$ |
| Control Current | Ictra |  | 2 | 5 | $\mu \mathrm{A}$ | $\begin{aligned} & \text { Supply Current (any active state), } \mathrm{V}_{\mathrm{DD}}=2.85 \mathrm{~V}, \\ & \mathrm{~V}_{\mathrm{CTL}}=1.8 \mathrm{~V} \end{aligned}$ |
| DC Supply Turn-on/ Turn-off Time | Ton |  |  | 20 | $\mu \mathrm{s}$ | Measured from $50 \%$ of final $V_{D D}$ supply voltage to fina RF power $\pm 1 \mathrm{~dB}$. |
| RF Path Switching Time | Tsw |  | 2 | 5 | $\mu \mathrm{s}$ | From one active state to another active state transition, measured from $50 \%$ of final $V_{\text {CTRL }}$ voltage to final RF power $\pm 1 \mathrm{~dB}$. |

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Logic Truth Table

| Path | VDD | VC1 | VC2 |
| :---: | :---: | :---: | :---: |
| RFC to RF1 | $H$ | L | H |
| RFC to RF2 | H | H | L |
| RFC to RF3 | H | H | H |
| RFC to RF4 | H | L | L |

Note: "H" $=+1.65 \mathrm{~V}$ to +3.0 V ; " $\mathrm{L} "=0 \mathrm{~V}$ to +0.35 V . Any state other than that described in this Table places the switch into an undefined state. An undefined state will not damage the device.

Pin Out


Pin Names and Descriptions

| Pin | Name | Description |
| :---: | :---: | :---: |
| 1 | VC1 | Control Voltage 1 |
| 2 | RF2 | RF Input/output Port 2 |
| 3 | RF1 | RF Input/output Port 1 |
| 4 | RFC | RF Common Port |
| 5 | RF3 | RF Input/output Port 3 |
| 6 | RF4 | RF Input/output Port 4 |
| 7 | VDD | Supply Voltage |
| 8 | VC2 | Control Voltage 2 |
| 9 | GND | Ground |

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Evaluation Board Schematic


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Evaluation Board Assembly Diagram


## PCB Layout Footprint



PCB METAL TOP VIEN


PCB SOLDERMASK TOP VIEW


PCB STENCIL TOP VIEW

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Package Dimensions


TOP VIEW


BOTTOM VIEW


SIDE VIEW

| Symbol | Dimensions In Millimeters |  | Dimensions In Inches |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Min. | Max. | Min. | Max. |
| A | 0.500 | 0.600 | 0.020 | 0.024 |
| A1 | -0.004 | 0.046 | 0.000 | 0.002 |
| A3 | $0.110 R E F$ |  | $0.004 R E F$ |  |
| D | 1.000 | 1.200 | 0.039 | 0.047 |
| E | 1.000 | 1.200 | 0.039 | 0.047 |
| k | $0.200 R E F$ |  | $0.008 R E F$ |  |
| b | 0.150 | 0.250 | 0.006 | 0.010 |
| e | $0.400 B S C$ |  | $0.016 B S C$ |  |
| L | 0.150 | 0.250 | 0.006 | 0.010 |
| L1 | $0.050 R E F$ |  | $0.002 R E F$ |  |

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## Revision History

| Revision | Date of Release | Description |
| :---: | :---: | :---: |
| Rev 1.0 | 2018.03 | Initial Version |
| Rev 1.1 | 2018.04 | Update electric specifications |
| Rev 1.2 | 2018.07 | Update RF specifications |
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[^0]:    Functional Block Diagram

