

0.1-6GHz DPDT Antenna Cross Switch

Features

- Broadband frequency range: 0.1 to 6.0GHz
- Wide VDD range: 1.65V to 3.3V
- GPIO interface for 1.0V to VDD positive control voltage
- Low insertion loss: 0.41dB typical @ 2.7GHz
- Max input RF power of 39dBm
- Excellent linearity and harmonic performance
- No DC blocking capacitors in typical application
- Small WBQFN (1.5mm x 1.1mm x 0.45mm -10L) package

Applications

- Cellular 2G/3G/4G/5G TRX
- Antenna switching
- Other RF front-end modules

General Description

The AW12022TQNR is a Silicon-On-Insulator(SOI) DPDT switch with low insertion loss and high Isolation. It can be used to support band switching and mode switching for cellular 4G/5G, data cards and tablets.

The symmetrical design of internal ports makes it convenient for PCB routing and adjustment of receiving and transmitting signals. The band/mode switching is realized by the GPIO pin as referenced in the chip block diagram and the control logic. The chip allows power-supply voltages from 1.65V to 3.3V and the positive control voltages from 1.0V to VDD.

The AW12022TQNR is provided in a compact WBQFN 1.5mm x 1.1mm x 0.45mm -10L package.

Typical Application Circuit

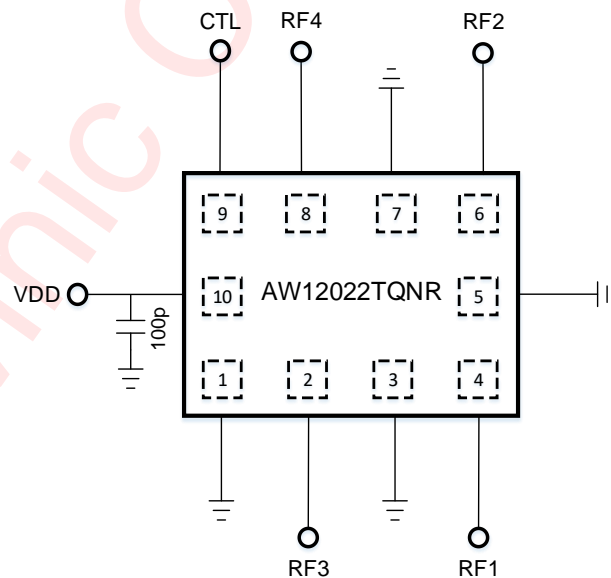


Figure 1 Typical Application Circuit Of AW12022TQNR

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Pin Configuration And Top Mark

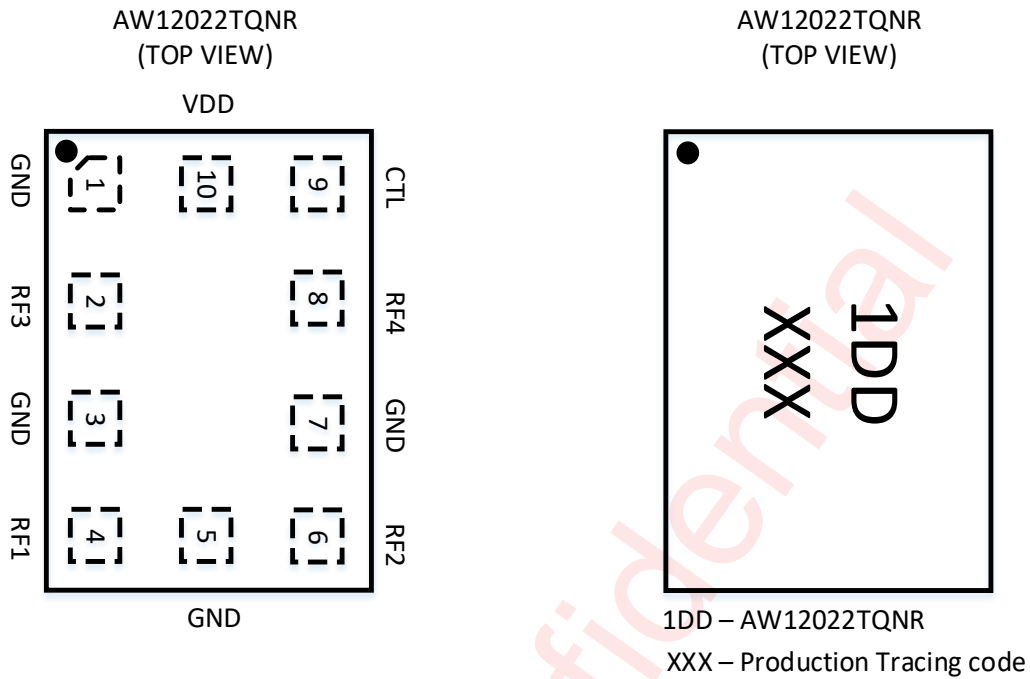


Figure 2 Pin Configuration And Top Mark

Pin Definition

No.	NAME	DESCRIPTION
1	GND	Ground
2	RF3	RF I/O path 3
3	GND	Ground
4	RF1	RF I/O path 1
5	GND	Ground
6	RF2	RF I/O path 2
7	GND	Ground
8	RF4	RF I/O path 4
9	CTL	DC control voltage
10	VDD	DC power supply

Functional Block Diagram

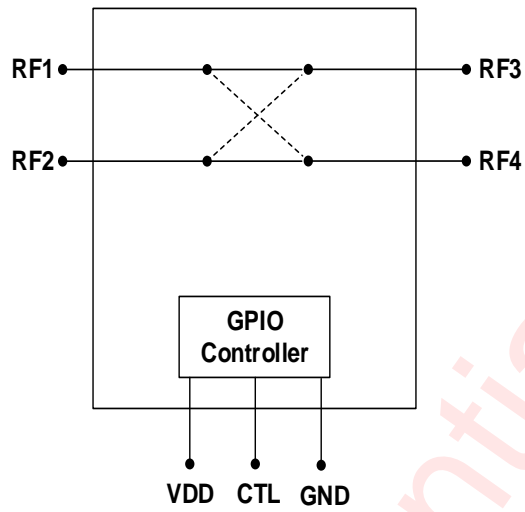


Figure 3 Functional Block Diagram

Ordering Information

Part Number	Temperature	Package	Marking	Moisture Sensitivity Level	Environmental Information	Delivery Form
AW12022TQNR	-40°C~85°C	WBQFN 1.5mm x 1.1mm x 0.45mm -10L	1DD	MSL1	ROHS+HF	4500 units/ Tape and Reel

Absolute Maximum Ratings^(NOTE1)

PARAMETERS		RANGE
Supply Voltage Range VDD		-0.3V to 3.6V
Control Voltage Range	CTL	-0.3V to 3.6V
RF input power		39.3dBm
Operating Free-air Temperature Range		-40°C to 85°C
Storage Temperature T _{STG}		-65°C to 150°C
Lead Temperature (Soldering 10 Seconds)		260°C
ESD		
HBM (ESDA/JEDEC JS-001) ^(NOTE 2)		±1000V
CDM (ESDA/JEDEC JS-002) ^(NOTE 3)		±500V

NOTE1: Conditions out of those ranges listed in "absolute maximum ratings" may cause permanent damages to the device. In spite of the limits above, functional operation conditions of the device should within the ranges listed in "recommended operating conditions". Exposure to absolute-maximum-rated conditions for prolonged periods may affect device reliability.

NOTE2: The human body model is a 100pF capacitor discharged through a 1.5kΩ resistor into each pin.

Test method: ESDA/JEDEC JS-001-2017

NOTE3: All pins. Test condition: ESDA/JEDEC JS-002-2018.

Electrical Characteristics

VDD=1.8/2.8V, CTL=0/1.8V, PIN=0dBm, T_A =+25°C, Z₀=50Ω. (unless otherwise noted)

PARAMETER		TEST CONDITION	MIN	TYP	MAX	UNIT
DC Specifications						
VDD	Supply Voltage		1.65	1.8	3.3	V
IDD	Supply Current	VDD=1.8V		45	70	μA
IDD	Supply Current	VDD=2.8V		48	80	μA
VCTL_H VCTL_L	Control Voltage High Low		1 0	1.8 0	VDD 0.3	V
ICTL	Control Current	VCTL = 1.8V		6	8	μA
t _{ON}	Turn-on Switching Time	50% of final control voltage to 90% of final RF power		2	3	μs
RF Specifications						
IL	Insertion Loss	699-960MHz		0.29	0.39	dB
		1710-2200MHz		0.37	0.47	dB
		2300-2690MHz		0.41	0.52	dB
		3300-4200MHz		0.47	0.59	dB
		4400-5000MHz		0.56	0.69	dB
		5150-5925MHz		0.64	0.81	dB
ISO	Isolation	699-960MHz	30	33		dB
		1710-2200MHz	22	25		dB
		2300-2690MHz	20	22		dB
		3300-4200MHz	17	20		dB
		4400-5000MHz	16	18		dB
		5150-5925MHz	15	17		dB
RL	Return Loss	699-960MHz	23	30		dB
		1710-2200MHz	21	26		dB
		2300-2690MHz	19	24		dB
		3300-4200MHz	15	20		dB
		4400-5000MHz	16	20		dB
		5150-5925MHz	12	17		dB
H2	Second Harmonics	35dBm, GSM LB, CW		-65	-55	dBm
H2	Second Harmonics	33dBm, GSM HB, CW		-70	-60	dBm
H3	Third Harmonics	35dBm, GSM LB, CW		-55	-45	dBm
H3	Third Harmonics	33dBm, GSM HB, CW		-60	-50	dBm
P _{0.1dB}	0.1dB Compression Point	0.1GHz–6GHz		39		dBm

Timing Diagram (Power ON And OFF Sequence)

It is very important that the user adheres to the correct power-on/off sequence in order to avoid damaging the device. The control signal CTL should be set to 0V unless VDD is set in the operating voltage range.

Power ON:

- 1) Apply voltage supply --- VDD
- 2) Set Controls---CTL
- 3) Apply RF input

Change switch position from one RF port to another:

- 1) Remove RF input
- 2) Change control voltages CTL to set the switch to desired RF port
- 3) Apply RF input

Power OFF:

- 1) Remove RF input
- 2) Remove control voltages-CTL
- 3) Remove VDD input

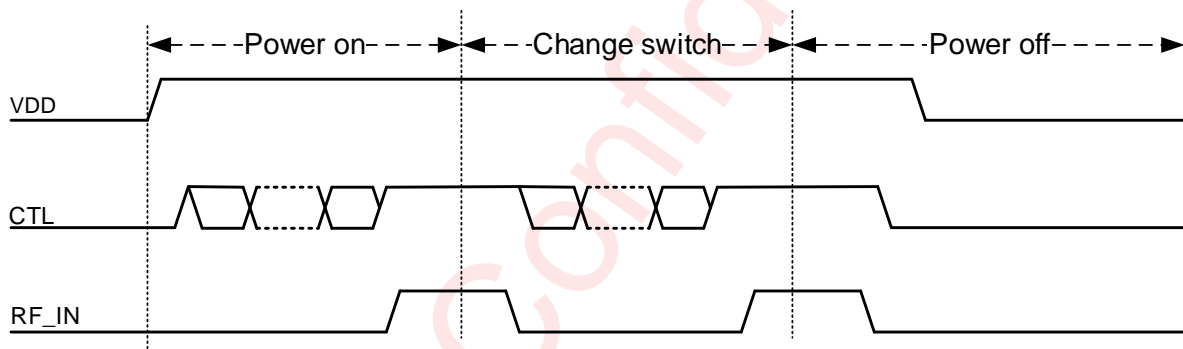


Figure 4 Power On/Change Switch/Power Off Sequence

AW12022TQNR Control Logic

State	Active Path	CTL
1	RF1 to RF4; RF2 to RF3	1
0	RF2 to RF4; RF1 to RF3	0

Application Circuits

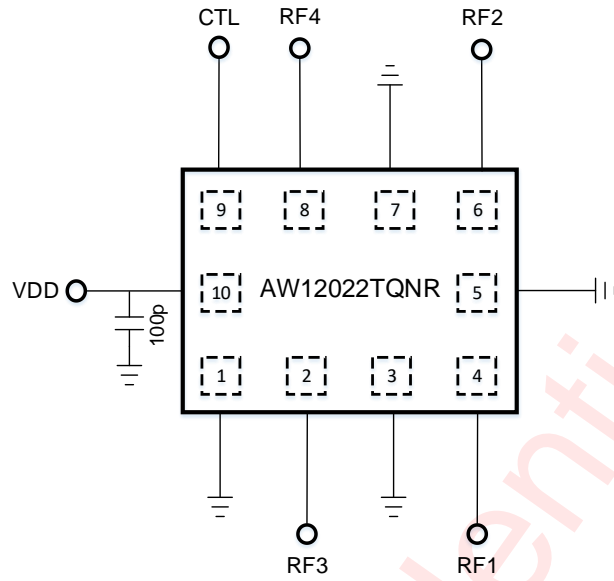
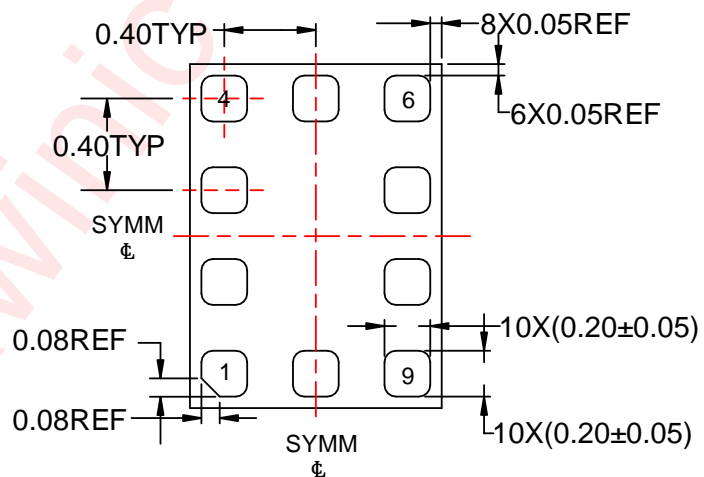
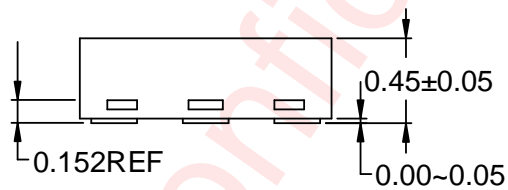
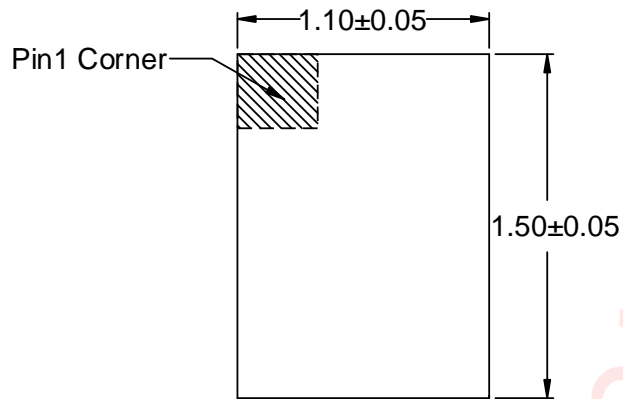


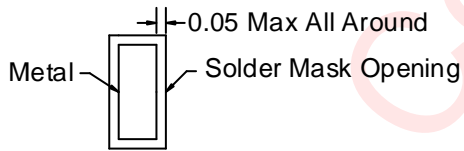
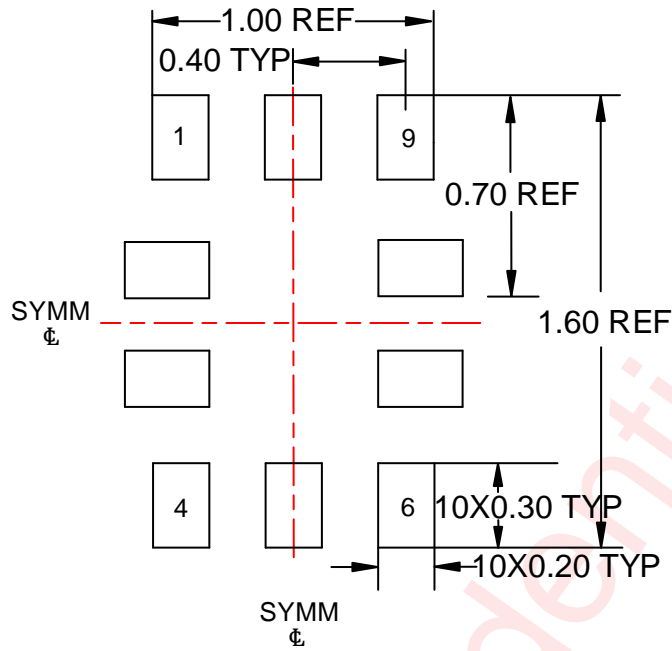
Figure 5 AW12022TQNR Application Schematic

Package Outline Dimensions

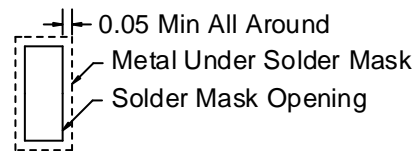


Unit:mm

Land Pattern Data



Non-solder Mask Defined



Solder Mask Defined

Unit:mm

Revision History

Version	Date	Change Record
V1.0	Jan. 2022	Officially Released
V1.1	Aug. 2022	Updated Supply Voltage Range VDD

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