SP4T Antenna Tuning Switch

Features

- High Voltage Handling, 39V
- High $P_{0.1dB}$, 42dBm
- Low On-Resistance,1.15Ω
- Low Off- Capacitance, 160fF
- linear performance
- Small FCQFN 1.5mm x 1.1mm x 0.37mm-10L package
- VDD=2.4 to 3.3V
- Broadband frequency range: 0.4 to 3.8 GHz

General Description

The AW17445 is a single-pole, four-throw (SP4T) antenna tuning switch, using CMOS silicon-on-insulator (SOI) process. The high voltage handling, high linear performance and low R_{on} and C_{OFF} make the switch very suitable for high performance antenna tuning application.

The AW17445 is provided very small FCQFN 1.5mm x 1.1mm x 0.37mm-10L package.

Applications

- Antenna Tuning Switch
- Band Switching
- Impedance Tuning

Typical Application Circuit

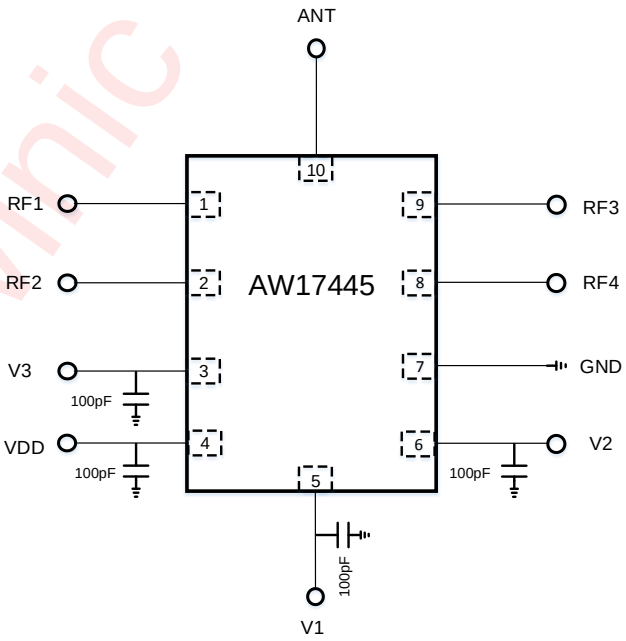


Figure 1 Typical Application Circuit of AW17445FCR

Pin Configuration And Top Mark

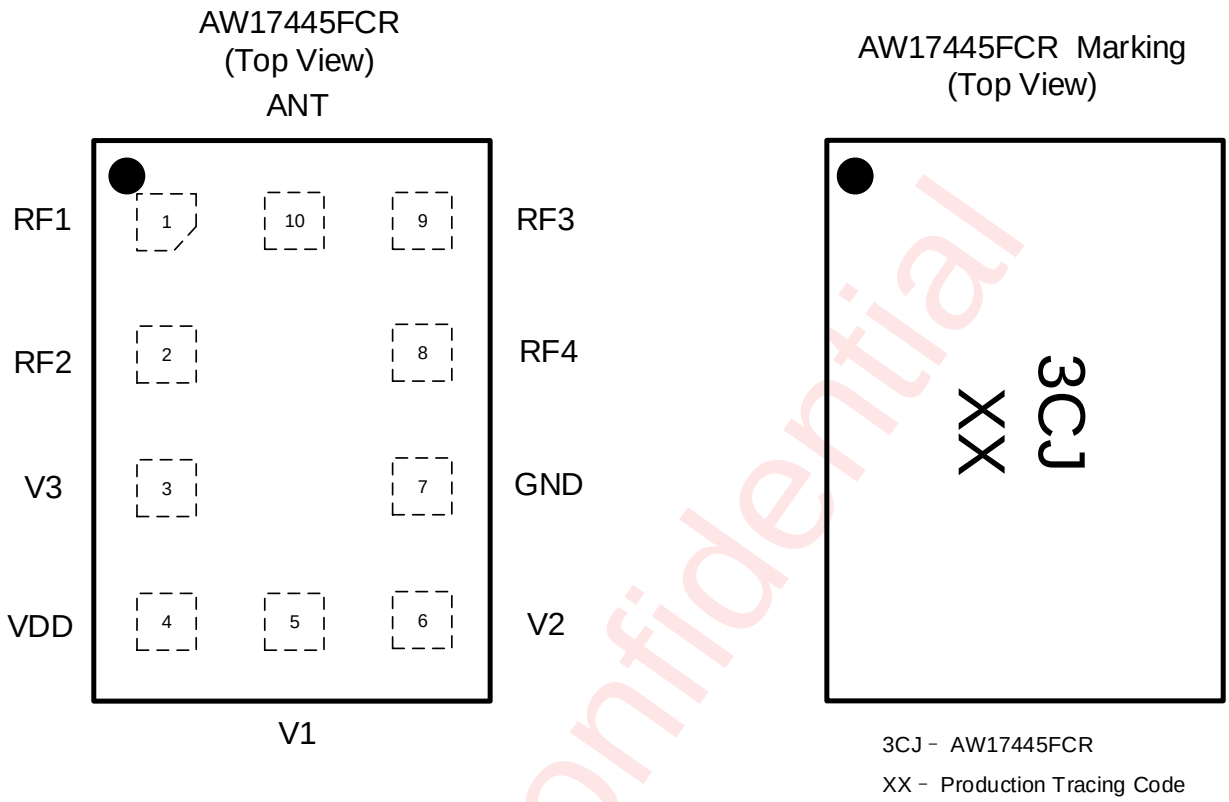


Figure 2 Pin Configuration and Top Mark

Pin Definition

No.	NAME	DESCRIPTION
1	RF1	RF1 port
2	RF2	RF2 port
3	V3	DC Control Voltage 3
4	VDD	Power Supply
5	V1	DC Control Voltage 1
6	V2	DC Control Voltage 2
7	GND	Ground
8	RF4	RF port4
9	RF3	RF port3
10	ANT	Antenna

Functional Block Diagram

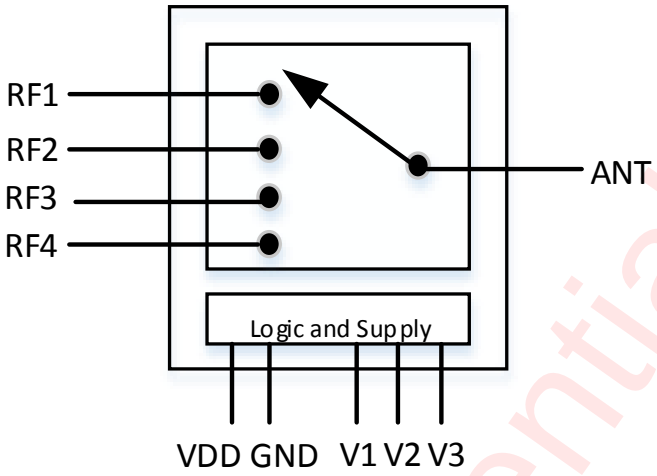


Figure 3 Functional Block Diagram

Ordering Information

Part Number	Temperature	Package	Marking	Moisture Sensitivity Level	Environmental Information	Delivery Form
AW17445FCR	-40°C～85°C	FCQFN 1.5mm x 1.1mm x 0.37mm-10L	3CJ	MSL1	ROHS+HF	4500 units/Tape and Reel

Absolute Maximum Ratings(NOTE1)

PARAMETERS	RANGE
Supply Voltage	2.4V to 3.6V
DC Control Voltage	0 to 3.3V
RF Input Power	43dBm
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(NOTE 2)	
HBM	±2000V
CDM	±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

V_{DD}=2.8V, V1=0/1.8V, V2=0/1.8V, V3=0/1.8V, PIN=0dBm, VSWR=1:1,Temp=25°C. (unless otherwise noted)

PARAMETER		TEST CONDITION	MIN	TYP	MAX	UNIT
DC Specifications						
Freq.	Operating Frequency		0.4		3.8	GHz
V_{DD}	Supply Voltage		2.4	2.8	3.3	V
V_{CTL_H}	Control Voltage High		1.3	1.8	3	V
V_{CTL_L}	Control Voltage Low		0	0	0.3	V
I_{DD}	Supply Current	V_{DD}=2.8V		80	120	μA
I_{CTRL}	Control Current	V_{CTRL}=1.8V		1	5	uA
RF Specifications						
IL	Insertion Loss	0.4 to 1.0 GHz		0.3	0.4	dB
		1.0 to 2.2 GHz		0.4	0.5	dB
		2.2 to 2.7 GHz		0.55	0.7	dB
		3.0 to 3.8 GHz		0.9	1.1	dB
ISO	Isolation	0.4 to 1.0 GHz	26	28		dB
		1.0 to 2.2 GHz	21	23		dB
		2.2 to 2.7 GHz	17	19		dB
		3.0 to 3.8 GHz	14	17		
RL	Return Loss	0.4 to 3.8 GHz	12	15		dB
R_{ON}	On Resistance	Switch Path On@1 GHz		1.15	1.35	Ω
C_{OFF}	Off Capacitance	Switch Path Off@1 GHz		160	210	fF
$P_{0.1dB}$	Input 0.1 dB compression point	0.4 to 3.8 GHz ANT to RF 1/2/3/4		42		dBm
V_{PEAK}	RFx Port Off Vpeak	0.4 to 3.8 GHz, 25% duty cycle RF power		39	45	V
2f0	LTE TX Harmonics	f0=400 to 3800 MHz, PIN=+26dBm		-80	-70	dBm
3f0				-90	-80	dBm
2f0	GSM LB Harmonics	f0=824 to 915 MHz, PIN=+35dBm		-65	-55	dBm
3f0				-65	-55	dBm
2f0	GSM HB Harmonics	f0=1710 to 2690 MHz, PIN=+33dBm		-65	-55	dBm
3f0				-65	-55	dBm
T_{ON}	Switching Time -ON	From 50% of V_{CTL} to 90% of final RF amplitude		3	10	μs
T_{OFF}	Switching Time -OFF	From 50% of V_{CTL} to 10% of final RF amplitude		3	10	μs

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 V1 should be set to 0V unless VDD is set in the operating voltage range.

Power ON:

1) Apply voltage supply --- VDD
2) Set Controls---V1/V2/V3
3) Wait at least 20μs and then apply RF input

Change switch position from one RF port to another:

1) Remove RF input
2) Change control voltages V1/V2/V3 to set the switch to desired RF port
3) Wait at least 20μs and then apply RF input

Power OFF:

1) Remove RF input
2) Remove control voltages---V1/V2/V3
3) Remove VDD input

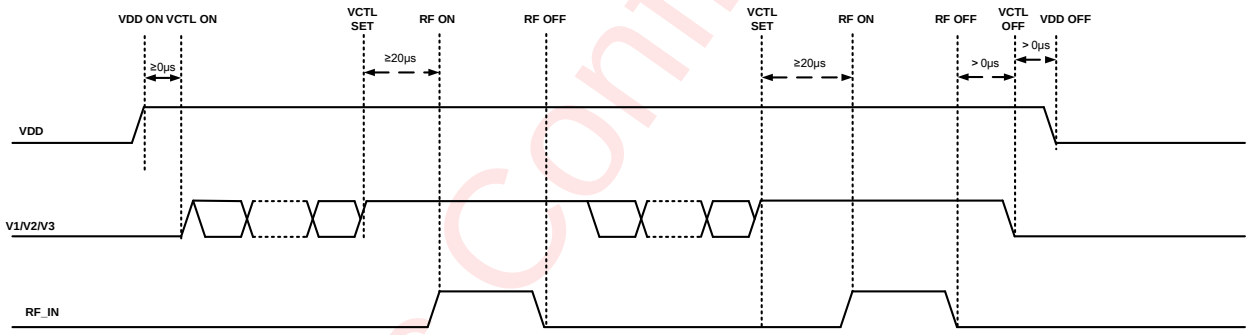


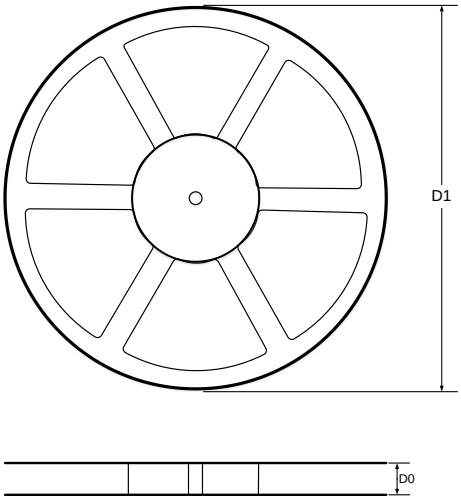
Figure 4 Power on/Change switch/Power off sequence

Truth Table

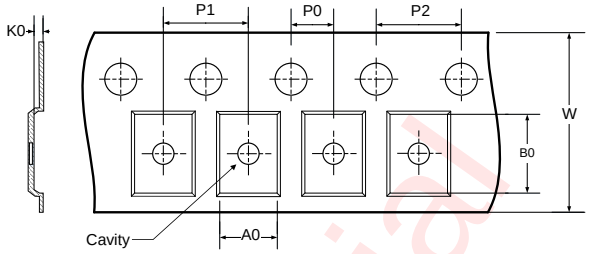
Active Path	V1	V2	V3	State
All RF On	0	0	1	1
ANT to RF1 and RF2	0	1	1	2
ANT to RF3 and RF4	1	0	1	3
ANT to RF1	0	0	0	4
ANT to RF2	0	1	0	5
ANT to RF3	1	0	0	6
ANT to RF4	1	1	0	7
All isolation	1	1	1	8

Tape And Reel Information

REEL DIMENSIONS

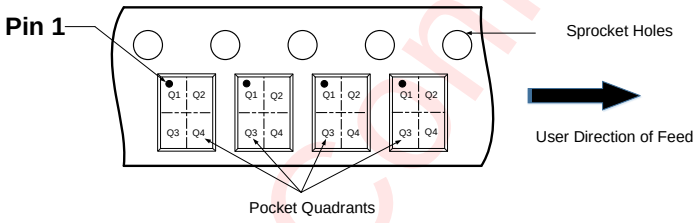


TAPE DIMENSIONS



A0：Dimension designed to accommodate the component width
B0：Dimension designed to accommodate the component length
K0：Dimension designed to accommodate the component thickness
W：Overall width of the carrier tape
P0：Pitch between successive cavity centers and sprocket hole
P1：Pitch between successive cavity centers
P2：Pitch between sprocket hole
D1：Reel Diameter
D0：Reel Width

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



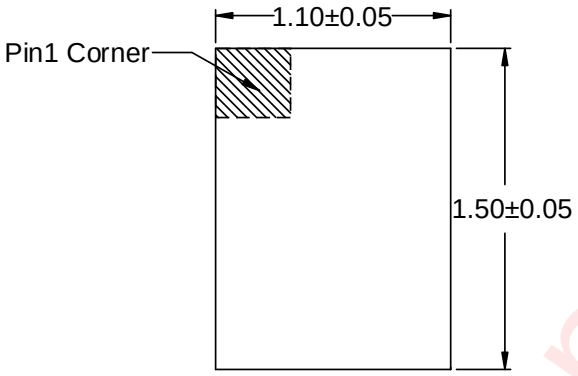
DIMENSIONS AND PIN1 ORIENTATION

D1 (mm)	D0 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
180	8.4	1.3	1.7	0.46	2	4	4	8	Q1

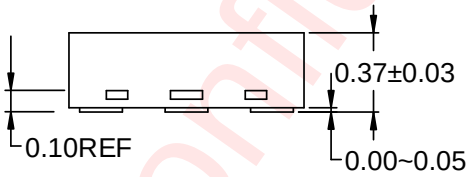
All dimensions are nominal

Figure 5 Tape and Reel

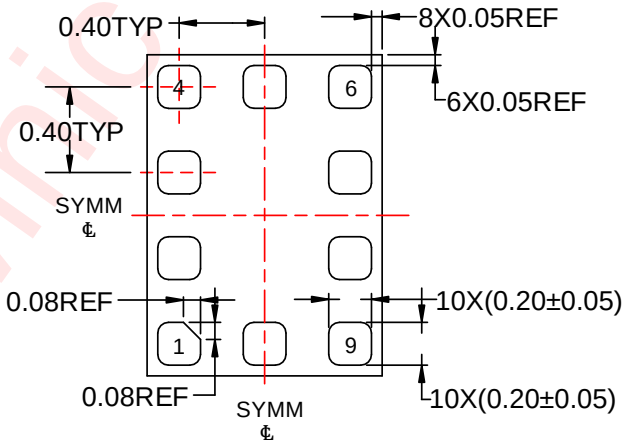
Package Description



TOP VIEW



SIDE VIEW



BOTTOM VIEW

Unit:mm

Figure 6 Package Outline

Land Pattern Data

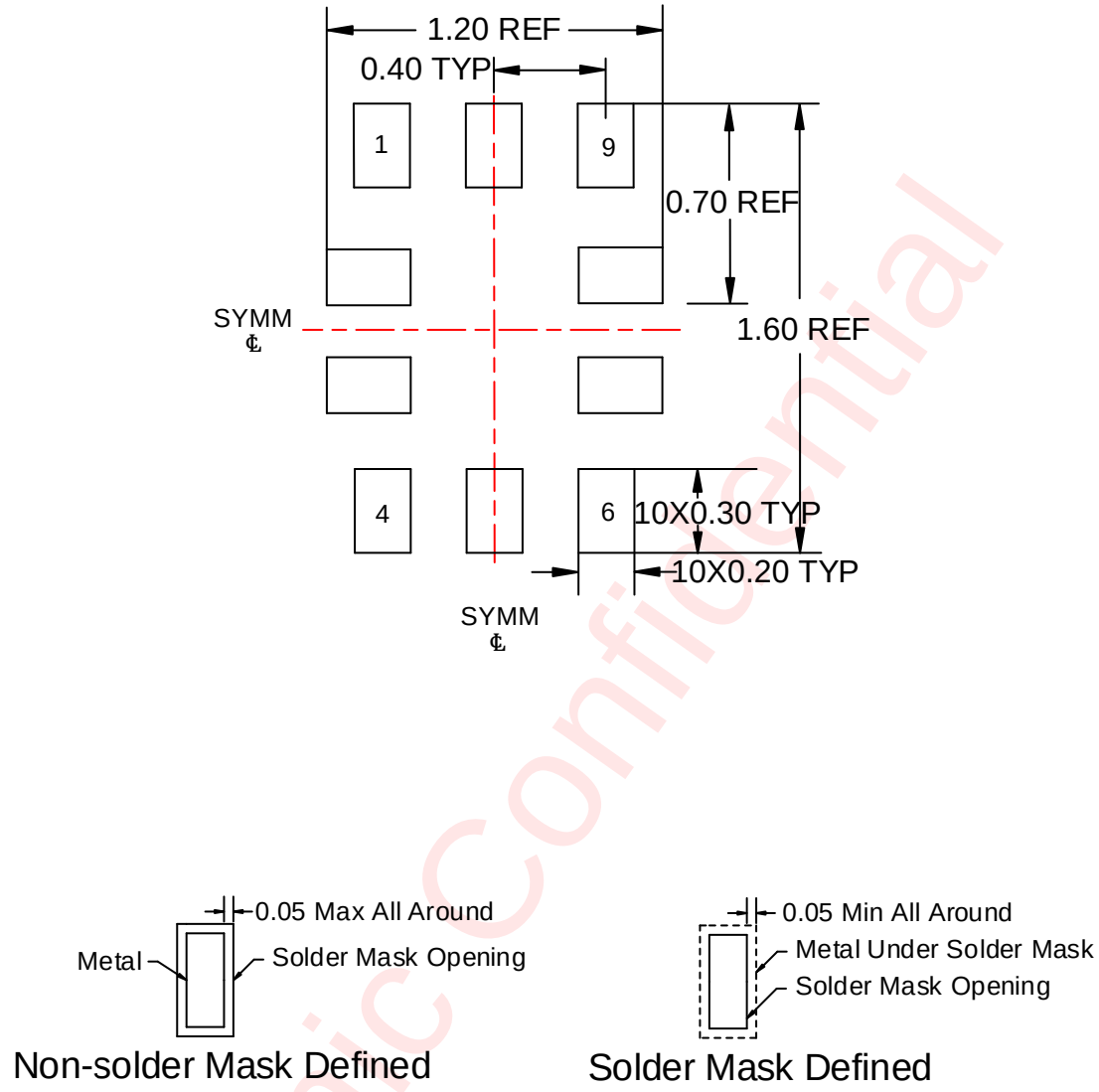


Figure 7 Land Pattern Data

Revision History

Version	Date	Change Record
V1.0	Nov. 2020	Officially Released
V1.1	Mar. 2021	Update electrical characteristics

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