0.1-6GHz DPDT Antenna Cross Switch

Features

- Broadband frequency range: 0.1 to 6.0GHz
- VDD range: 1.65V to 3.3V
- High isolation: 30dB typical @ 5.9GHz
- Max input RF power of 39dBm
- Excellent linearity and harmonic performance
- No DC blocking capacitors in typical application
- Small FCLGA (1.55mm x 1.15mm x 0.47 mm - 10L) package

Applications

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

General Description

The AW12122FLR 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.

The AW12122FLR is provided in a compact FCLGA 1.55mm x 1.15mm x 0.47mm -10L package.

Typical Application Circuit

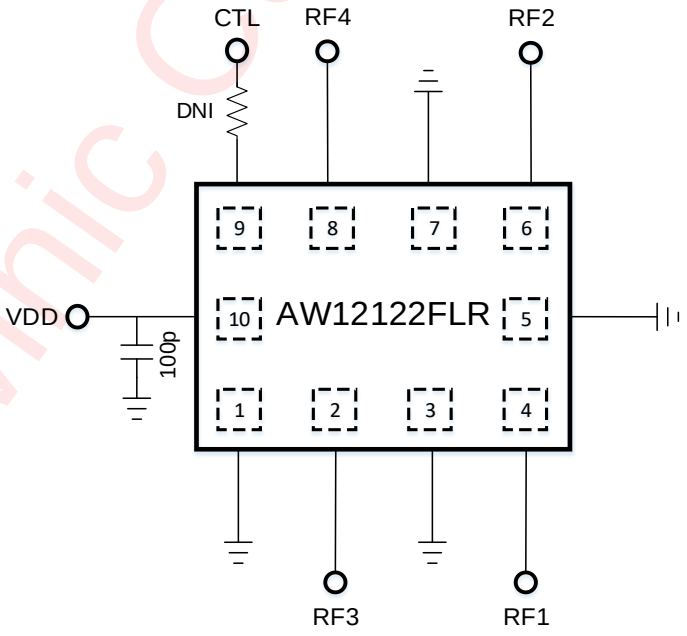


Figure 1 Typical Application Circuit Of AW12122FLR

Pin Configuration And Top Mark

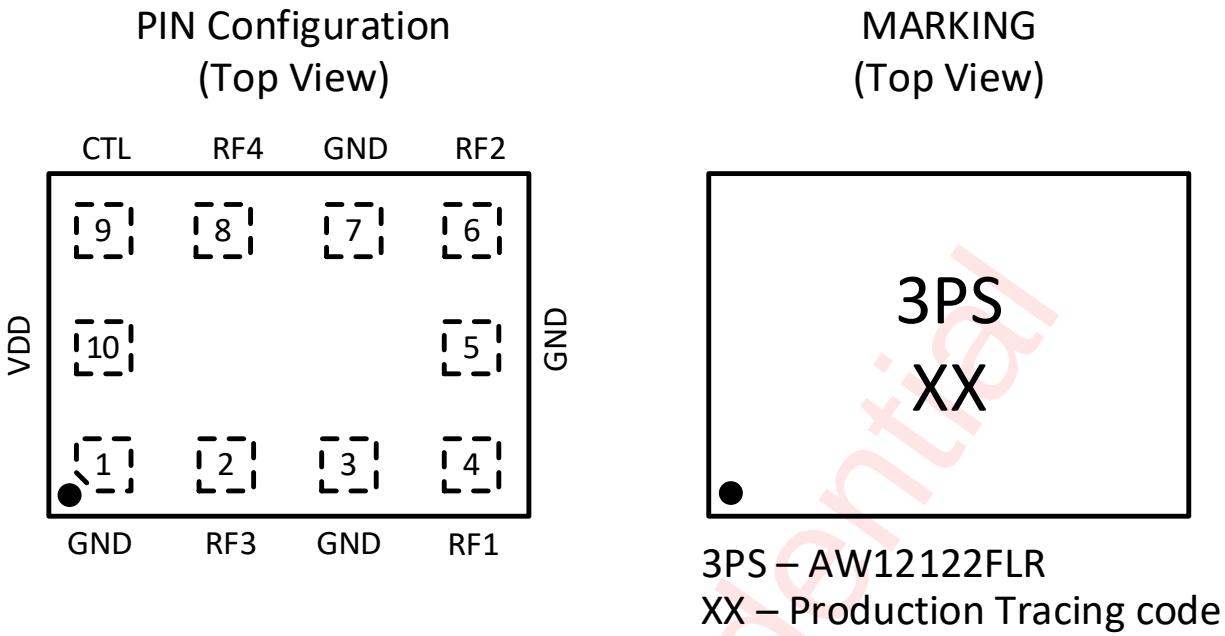


Figure 2 Pin Configuration And Top Mark

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

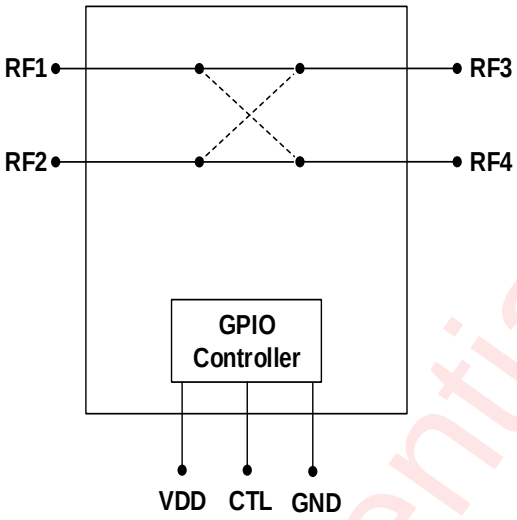


Figure 3 Functional Block Diagram

Ordering Information

Part Number	Temperature	Package	Marking	Moisture Sensitivity Level	Environmental Information	Delivery Form
AW12122FLR	-30°C～85°C	FCLGA 1.55mm x 1.15mm x 0.47 mm -10L	3PS	MSL3	ROHS+HF	3000 units/ Tape and Reel

Absolute Maximum Ratings(NOTE1)

PARAMETERS	RANGE
Supply Voltage Range VDD	-0.3V to 3.6V
Control Voltage Range VCTL	-0.3V to 3.6V
GMSK LB signal, 12.5% Duty cycle output port VSWR=1:1, +85°C	39dBm
GMSK HB signal, 12.5% Duty cycle output port VSWR=1:1, +85°C	39dBm
LTE,1RB QPSK, output port VSWR=1:1, +85°C	34dBm
Operating Free-air Temperature Range	-30°C to 85°C
Storage Temperature T_{STG}	-40°C to 125°C
Lead Temperature (Soldering 10 Seconds)	260°C
ESD	
HBM (NOTE 2)	±1000V
CDM (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. HBM standard: ESDA/JEDEC JS-001-2017.

NOTE3: CDM standard: ESDA/JEDEC JS-002-2018.

Electrical Characteristics

VDD=1.8/2.8V, CTL=0/1.8V, PIN=0dBm, T_A =+25℃, Z_0=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		54	120	μA
IDD	Supply Current	VDD=2.8V		76	120	μA
VCTL_H VCTL_L	Control Voltage High Low		0.7*VDD 0	1.8 0	VDD 0.2*VDD	V V
ICTL	Control Current	VDD=VCTL = 1.8V		5	10	μA
t_{ON}	Turn-on Switching Time	50% of final control voltage to 90% of final RF power		1.8	3	μS
t_{OFF}	Turn-off Switching Time	50% of final control voltage to 10% of final RF power		1.6	3	μS
RF Specifications						
IL	Insertion loss	617-960MHz 960-2170MHz 2300-2690MHz 3300-3800MHz 3800-4200MHz 4400-5000MHz 5150-5925MHz		0.42 0.48 0.50 0.70 0.79 0.86 0.98	0.65 0.70 0.70 1.00 1.30 1.50 1.70	dB dB dB dB dB dB dB
IL (-30~85℃)	Insertion loss	617-960MHz 960-2170MHz 2300-2690MHz 3300-3800MHz 3800-4200MHz 4400-5000MHz 5150-5925MHz		0.42 0.48 0.52 0.75 0.79 0.86 0.98	0.75 0.80 0.85 1.20 1.40 1.60 1.80	dB dB dB dB dB dB dB
ISO	Isolation All RFx-RFx	617-960MHz 960-2170MHz 2300-2700MHz 3300-3800MHz 3800-4200MHz 4400-5000MHz 5150-5925MHz	35 30 30 29 29 28 27	53 50 48 46 45 39 34		dB dB dB dB dB dB dB
VSWR	Voltage standing wave ratio	617-960MHz 960-2170MHz 2300-2700MHz 3300-3800MHz 3800-4200MHz 4400-5000MHz 5150-5925MHz		1.10 1.16 1.28 1.50 1.50 1.70 2.00	1.30 1.40 1.60 2.00 2.30 2.40 2.60	:1 :1 :1 :1 :1 :1 :1
H2, H3	Second and third harmonics VSWR=1:1	34.5dBm, GSM850/900 Tx, CW		-57	-43	dBm
		32dBm, GSM 1800/1900 Tx, CW		-65	-43	dBm
		34.5dBm, GSM850/900 Tx, CW		-49	-40	dBm

PARAMETER		TEST CONDITION	MIN	TYP	MAX	UNIT
	Second and third harmonics VSWR=5:1	32dBm, GSM 1800/1900 Tx, CW		-53	-40	dBm
H2, H3	Second and third harmonics VSWR=1:1	617-960MHz, CW , 26dBm		-85	-43	dBm
		960-2170MHz, CW , 26dBm		-85	-43	dBm
		2400-2483.5MHz, CW , 18dBm		-85	-43	dBm
		2170-2700MHz, CW , 29dBm		-65	-43	dBm
		3300-3800MHz, CW , 29dBm		-65	-43	dBm
		3800-4200MHz, CW , 29dBm		-65	-43	dBm
		4400-5000MHz, CW , 29dBm		-65	-43	dBm
		5150-5925MHz, CW , 26dBm		-65	-43	dBm
H2, H3	Second and third harmonics VSWR=5:1	617-960MHz, CW , 26dBm		-70	-43	dBm
		960-2170MHz, CW , 26dBm		-70	-43	dBm
		2400-2483.5MHz, CW , 18dBm		-70	-43	dBm
		2170-2700MHz, CW , 29dBm		-50	-43	dBm
		3300-3800MHz, CW , 29dBm		-50	-43	dBm
		3800-4200MHz, CW , 29dBm		-50	-43	dBm
		4400-5000MHz, CW , 29dBm		-50	-43	dBm
		5150-5925MHz, CW , 26dBm		-50	-43	dBm
Harmonics	nf0<12.75GHz VSWR=1:1	617-960MHz, CW , 26dBm		-85	-43	dBm
		960-2170MHz, CW , 26dBm		-85	-43	dBm
		2400-2483.5MHz, CW , 18dBm		-85	-43	dBm
		2170-2700MHz, CW , 29dBm		-65	-43	dBm
		3300-3800MHz, CW , 29dBm		-65	-43	dBm
		3800-4200MHz, CW , 29dBm		-65	-43	dBm
		4400-5000MHz, CW , 29dBm		-65	-43	dBm
		5150-5925MHz, CW , 26dBm		-65	-43	dBm
Harmonics	nf0<12.75GHz VSWR=5:1	617-960MHz, CW , 26dBm		-70	-43	dBm
		960-2170MHz, CW , 26dBm		-70	-43	dBm
		2400-2483.5MHz, CW , 18dBm		-70	-43	dBm
		2170-2700MHz, CW , 29dBm		-50	-43	dBm
		3300-3800MHz, CW , 29dBm		-50	-43	dBm
		3800-4200MHz, CW , 29dBm		-50	-43	dBm
		4400-5000MHz, CW , 29dBm		-50	-43	dBm
		5150-5925MHz, CW , 26dBm		-50	-43	dBm
IIP2	2nd order intercept point	f1=26dBm, 1950MHz f2=-20dBm, 4090MHz	110	120		dBm
IIP3	3nd order intercept point	f1=26dBm, 2560MHz f2=-10dBm, 3310MHz	65	80		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

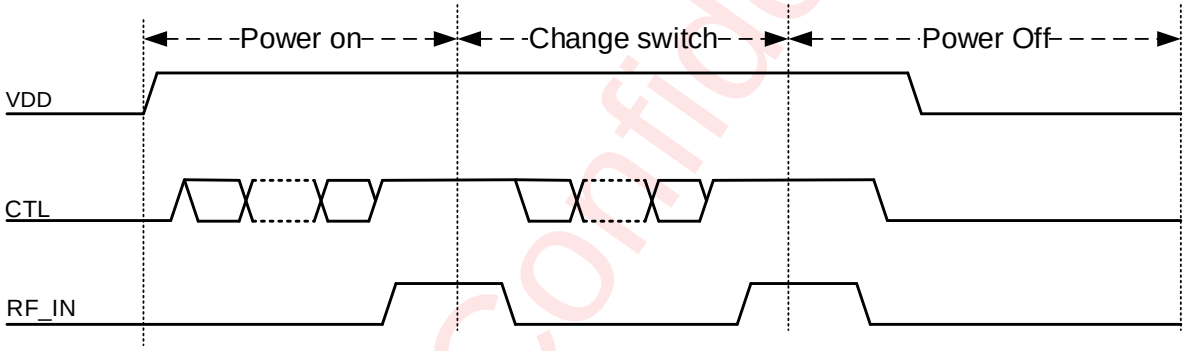
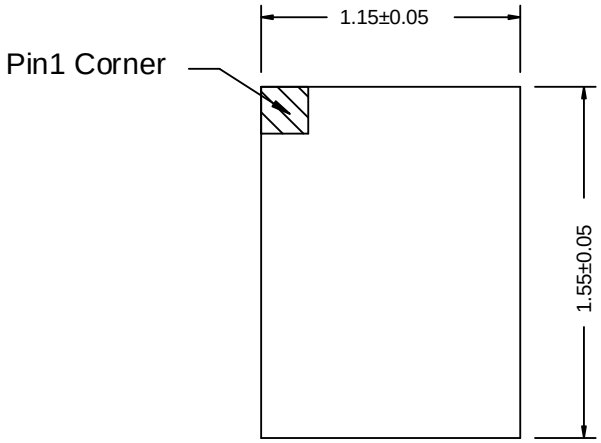


Figure 4 Power On/Change Switch/Power Off Sequence

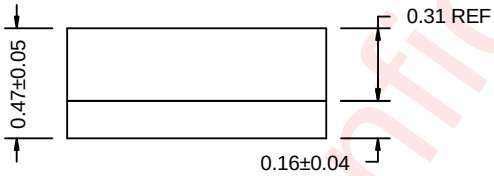
AW12122FLR Control Logic

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

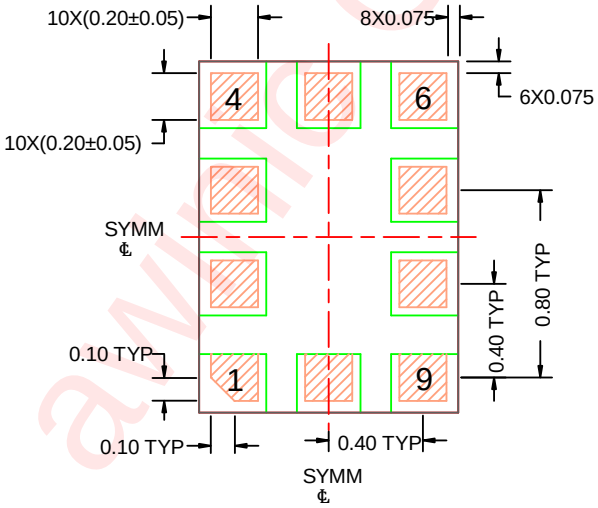
Package Outline Dimensions



TOP VIEW



SIDE VIEW



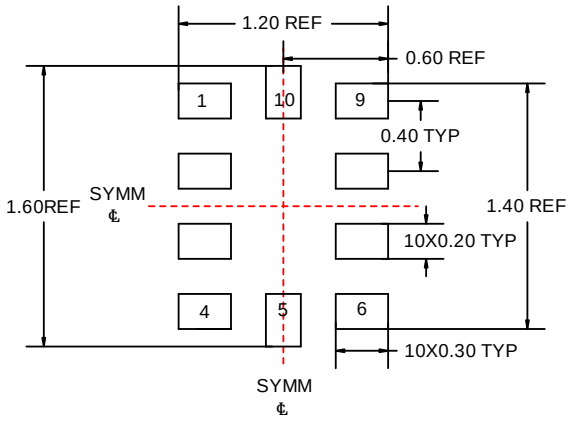
Solder mask opening

LGA pad

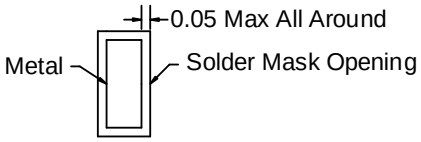
Unit: mm

BOTTOM VIEW

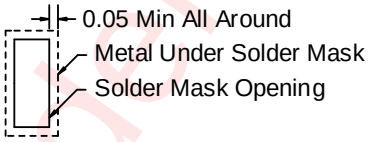
Land Pattern Data



Unit: mm



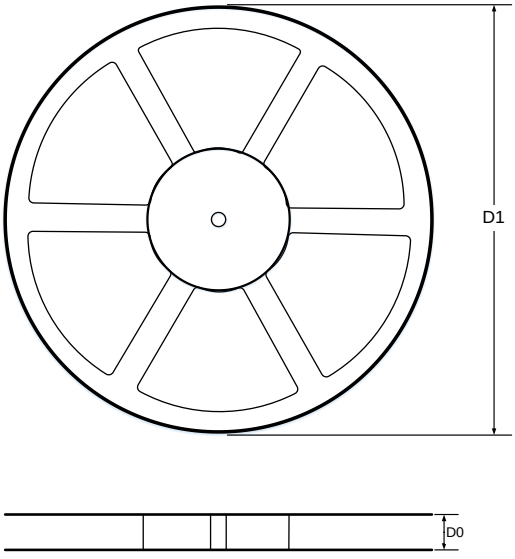
Non-solder Mask Defined



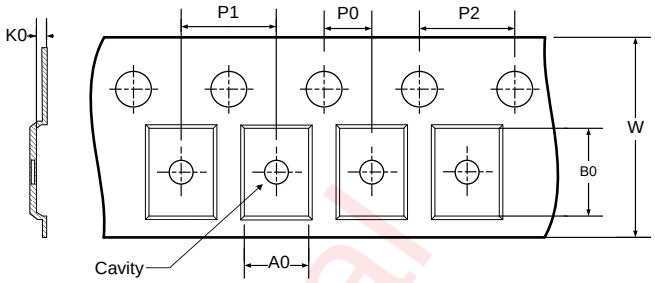
Solder Mask Defined

Tape And Reel Information

REEL DIMENSIONS

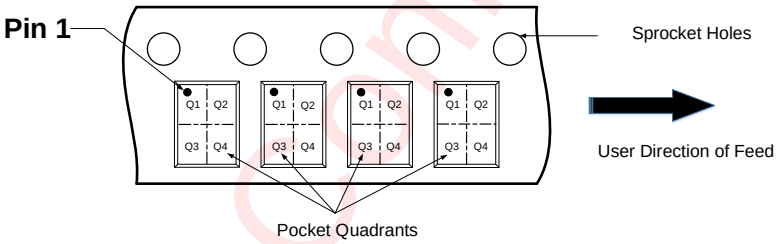


TAPE DIMENSIONS



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	9.5	1.3	1.7	0.6	2	4	4	8	Q1

All dimensions are nominal

Revision History

Version	Date	Change Record
V1.0	Nov. 2020	Officially Released
V1.1	Dec. 2020	Update electrical characteristics
V1.2	Oct. 2021	Add H2 and H3 at 1710-1980MHz
V1.3	Mar. 2022	Update electrical characteristics
V1.4	Mar. 2022	Update electrical characteristics
V1.5	Mar. 2022	Update electrical characteristics
V1.6	Apr. 2022	Update typical application circuit, IL max. limit at 960-2170MHz and 3300-5925MHz, ISO min. limit at 617-2700MHz.
V1.7	May. 2022	Update application specification
V1.8	Aug. 2022	Update electrical characteristics
V1.9	May. 2023	Update VCTL and Application Circuit

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