0.1-6GHz SPDT Switch for High Power Applications

Features

- Broadband frequency range: 0.1 to 6 GHz
- High power handling capability of up to 39 dBm
- Low insertion loss : 0.52 dB typical @ 6.0 GHz
- High isolation: 27 dB typical @ 6.0 GHz
- High switching speed: 1 us typical
- Low harmonic generation
- Small FCLGA (6-pin, 1.1mm x 0.7mm x 0.47mm) package

Applications

- Multi-Mode GSM/CDMA/WCDMA/LTE and NR including n77, n78, n79 bands
- Cellular modems, tablets and USB Devices
- Other RF front-end modules

General Description

The AW13612FLR is a single-pole dual-throw switch with high power handling capability of up to 39dBm and low insertion loss. It can be used to support band switching and mode switching for GSM, WCDMA, LTE, and NR applications.

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 pins as referenced in the chip block diagram and the control logic.

The AW13612FLR is provided in a compact FCLGA 1.1mm x 0.7mm x 0.47mm-6L package.

Typical Application Circuit

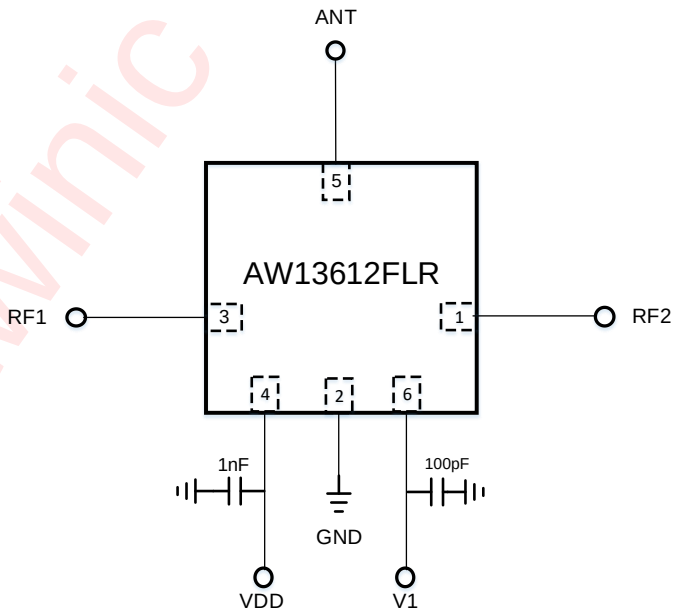
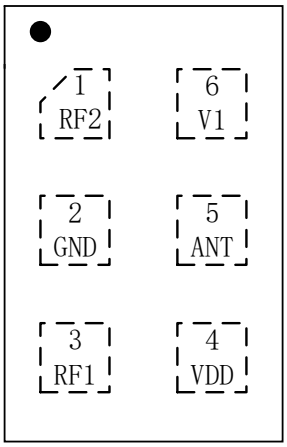


Figure 1 Typical Application Circuit of AW13612FLR

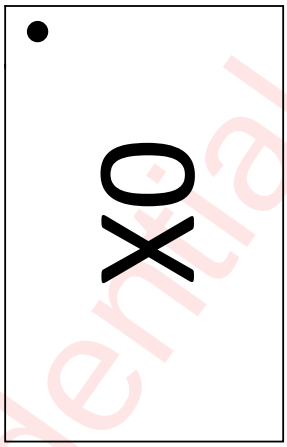
Pin Configuration And Top Mark

AW13612FLR
(Top View)



TOP VIEW

AW13612FLR Marking
(Top View)



0 – AW13612FLR
X – Production Tracing code

Figure 2 Pin Configuration and Top Mark

Pin Definition

No.	NAME	DESCRIPTION
1	RF2	RF I/O path 2
2	GND	Ground
3	RF1	RF I/O path 1
4	VDD	DC power supply
5	ANT	Antenna port
6	V1	DC control voltage 1

Functional Block Diagram

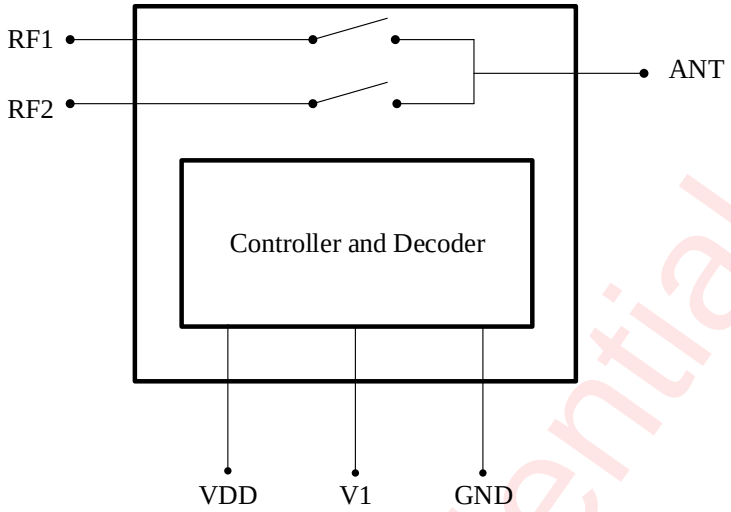


Figure 3 FUNCTIONAL BLOCK DIAGRAM

Ordering Information

Part Number	Temperature	Package	Marking	Moisture Sensitivity Level	Environmental Information	Delivery Form
AW13612FLR	-40°C～85°C	FCLGA 1.1mmX0.7mm-6L	0	MSL3	ROHS+HF	3000 units/ Tape and Reel

Absolute Maximum Ratings(NOTE1)

PARAMETERS	RANGE	Note / Test Condition
Supply Voltage Range VDD	-0.3V to 3.6V	
Control Voltage Range V1	0V to 3.3V	
Max input power (RF1/RF2/ANT)	39dBm	900MHz, CW, VSWR=1:1
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 (NOTE 2)	±2000V	
CDM (NOTE 3)	±2000V	

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 HBM is a 100pF capacitor discharged through a 1.5kΩ resistor into each pin. Test condition: ESDA/JEDEC JS-001-2017.

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

Electrical Characteristics

VDD=1.8V, V1=0/1.8V, P_{IN}=0dBm, Temp=+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			47	100	μA
VCTL_H VCTL_L	Control Voltage High Low		1.35 -0.3	1.8	3.3 0.45	V
ICTL	Control Current	VCTL = 1.8V		0.1	1	μA
Tsw	Turn-on Switching Time	50% of final control voltage to 90% of final RF power, switching between RF1/2		1.0	2.0	μs
RF Specifications						
IL	Insertion loss	617-960MHz 960-2170 MHz 2170-2700 MHz 3300-3800 MHz 3800-5000 MHz 5150-5925 MHz		0.20 0.26 0.28 0.31 0.37 0.52	0.29 0.36 0.39 0.46 0.58 0.79	dB dB dB dB dB dB
ISO ANT-RFx	Isolation ANT to RF1/2 Port	617-960MHz 960-2170 MHz 2170-2700 MHz 3300-3800 MHz 3800-5000 MHz 5150-5925 MHz	38 30 29 26 25 21	41 37 34 31 29 26		dB dB dB dB dB dB
ISO RFx-RFx	Isolation RF1/2 to RF2/1 Port	617-960MHz 960-2170 MHz 2170-2700 MHz 3300-3800 MHz 3800-5000 MHz 5150-5925 MHz	44 36 33 28 25 21	50 43 40 33 30 27		dB dB dB dB dB dB
RL	Input return loss	617-960MHz 960-2170 MHz 2170-2700 MHz 3300-3800 MHz	25 18 17 16	29 22 20 19		dB dB dB dB

PARAMETER		TEST CONDITION	MIN	TYP	MAX	UNIT
		3800-5000 MHz 5150-5925 MHz	13 10	17 15		dB dB
2fo	Second harmonics	PIN=+35dBm, 900MHz,CW		-66	-54	dBm
3fo	Third harmonics	PIN=+35dBm, 900MHz,CW		-58	-50	dBm
IMD2	Second order intermodulation	IMD2 Testcases		-116	-101	dBm
IMD3	Third order intermodulation	IMD3 Testcases		-89	-81	dBm
IIP2	Second order intercept point	IMD2 Testcases	110	125		dBm
IIP3	Third order intercept point	IMD3 Testcases	70	74		dBm
$P_{0.1dB}$	0.1dB Compression Point (ANT pin to RF1/RF2)	900MHz, CW VSWR = 1:1		39		dBm

IMD2 Testcases

Band	In-Band Frequency [MHz]	Blocker Frequency 1 [MHz]	Blocker Power 1 [dBm]	Blocker Frequency 2 [MHz]	Blocker Power 2 [dBm]
Band1	2140	1950	24	4090	-15
Band2	1960	1880	24	3840	-15
Band7	2652	2535	24	5187	-15

IMD3 Testcases

Band	In-Band Frequency [MHz]	Blocker Frequency 1 [MHz]	Blocker Power 1 [dBm]	Blocker Frequency 2 [MHz]	Blocker Power 2 [dBm]
Band1	2140	1950	20	1760	20
Band2	1960	1880	20	1800	20
Band5	881.5	836.5	20	791.5	20

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
3) Apply RF input

Change switch position from one RF port to another:

1) Remove RF input
2) Change control voltages V1 to set the switch to desired RF port
3) Apply RF input

Power OFF:

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

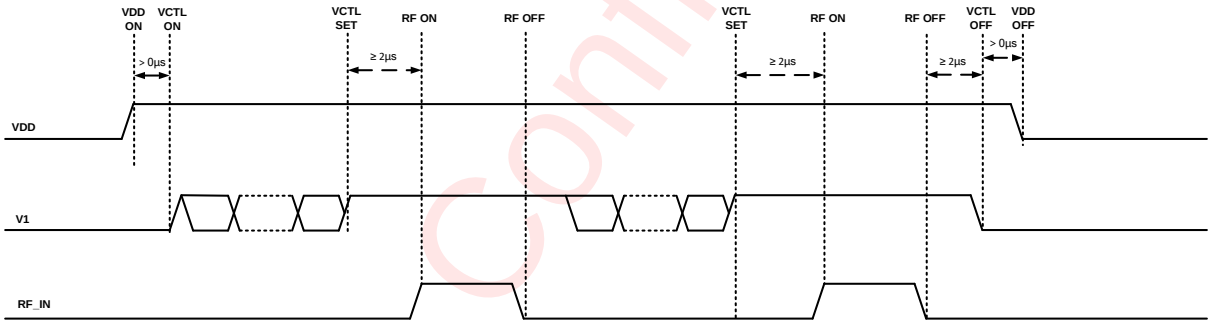


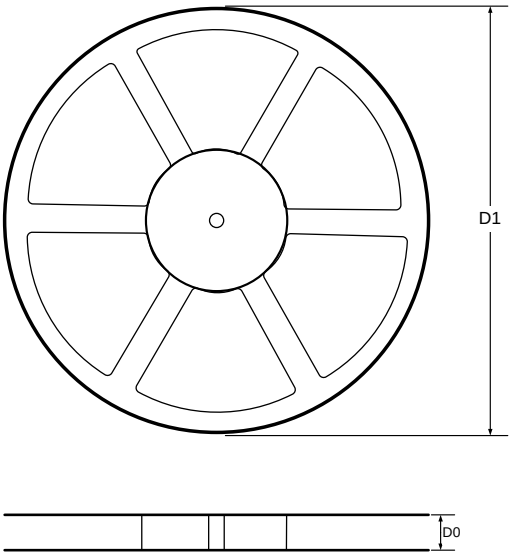
Figure 4 Power on/Change switch/Power off sequence

AW13612FLR Control Logic

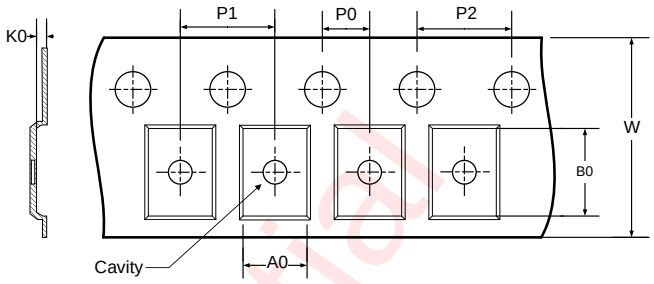
State	Active Path	V1
0	ANT to RF1	0
1	ANT to RF2	1

Tape And Reel Information

REEL DIMENSIONS

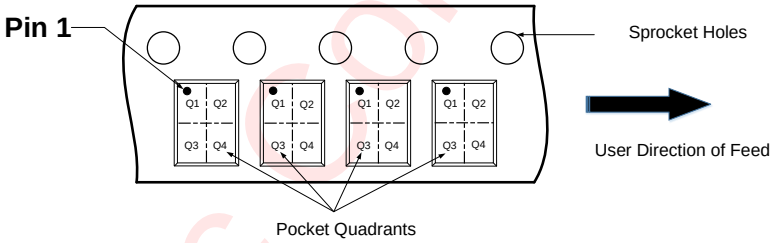


TAPE DIMENSIONS



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	0.8	1.2	0.56	2	4	4	8	Q1

All dimensions are nominal

Figure 5 Tape and Reel

Package Description

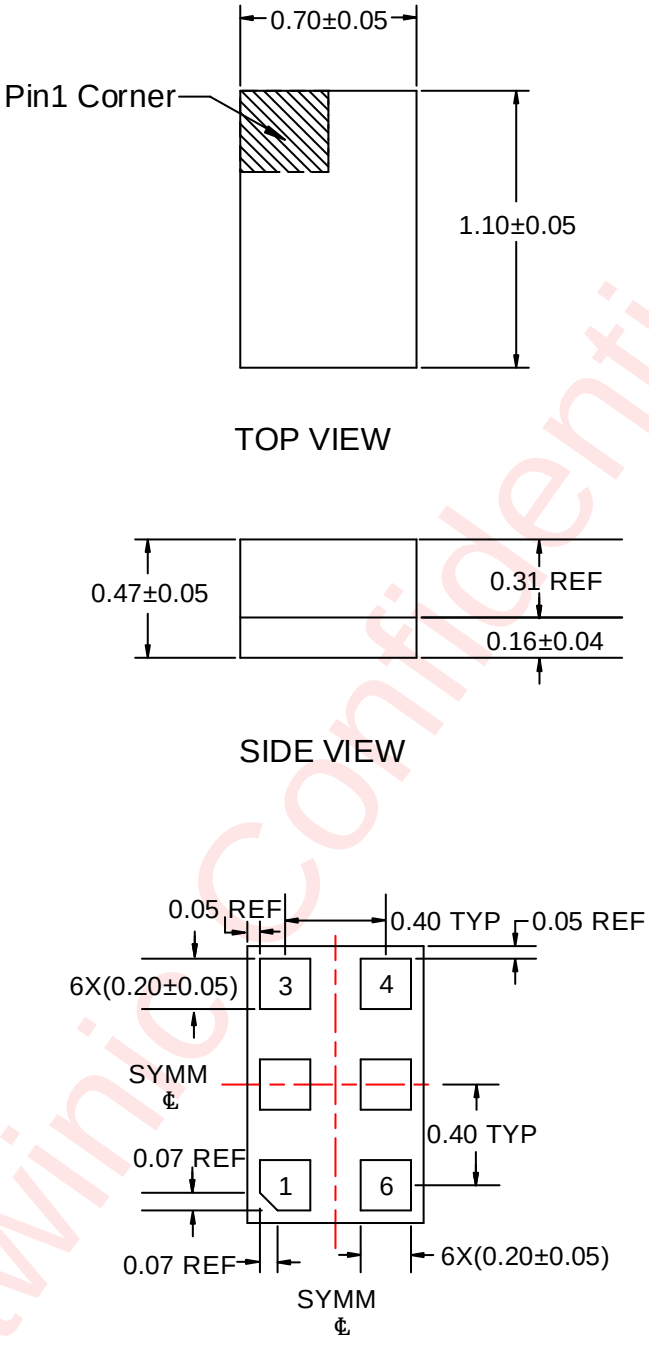


Figure 6 Package Outline

Land Pattern Data

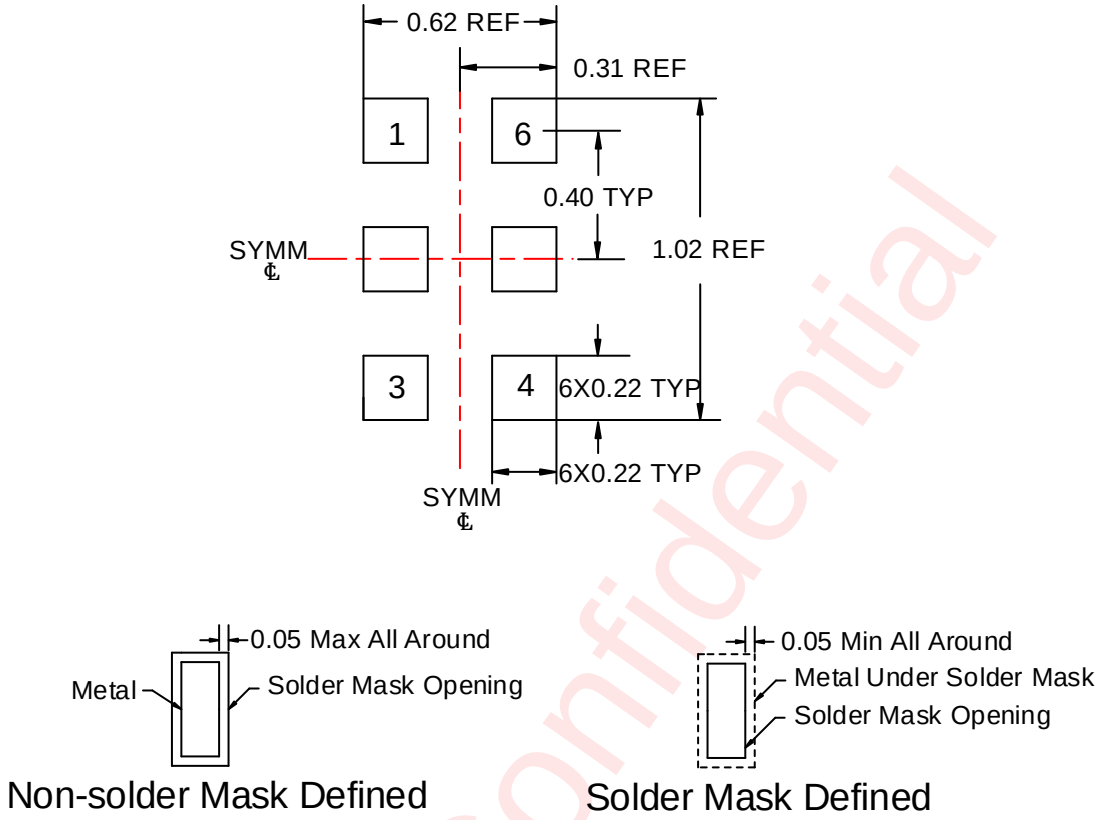


Figure 7 Land Pattern Data

Reflow

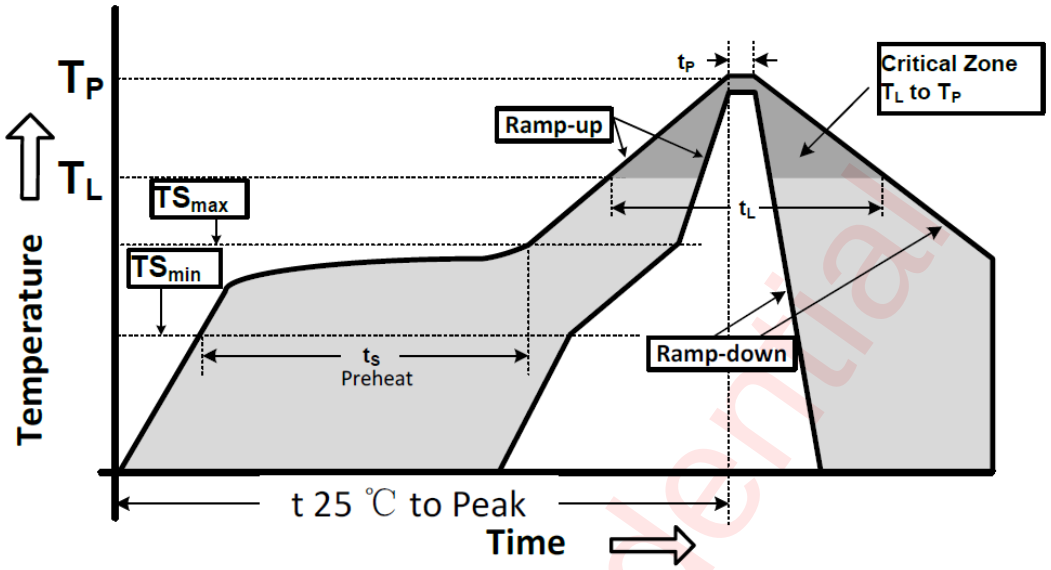


Figure 8 Recommended Lead-Free Reflow Profile

Reflow Note	Spec
Ramp-up rate (TS_{max} to T_p)	3℃/second max.
Preheat temperature (TS_{min} to TS_{max})	150℃ to 200℃
Preheat time (t_s)	60 - 180 seconds
Time above T_L , 217℃ (t_L)	60 - 150 seconds
Peak temperature (T_p)	260℃
Time within 5℃ of peak temperature (t_p)	20 - 40 seconds
Ramp-down rate	6℃/second max.
Time 25℃ to peak temperature	8 minutes max.

Revision History

Version	Date	Change Record
V1.0	Nov. 2020	Officially Released
V1.1	Dec. 2020	Updated ESD and RF Specifications
V1.2	Feb. 2021	Updated RF Specifications
V1.3	Nov. 2022	Updated Features and General Description

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