

## Fully-integrated 2.4G Low Noise Amplifier with Bypass Switch

### Features

- Ultra low current=2.7 mA
- Low noise figure(NF)=2.0 dB
- High power gain=14 dB
- High input 1dB-compression point=-4 dBm
- Integrated input matching inductor
- Supply voltage: 1.65 V to 1.95 V
- Operating frequencies: 2400~2500 MHz
- FCDFN 1.1 mm X 0.9 mm X 0.37 mm-6L package
- $\pm 1$  kV HBM ESD protection (including RFIN and RFOUT pin)

### Applications

- Smart phones, feature phones
- Tablet PCs
- RF Front End modules
- 2.4 GHz Bluetooth
- BLE wearable devices

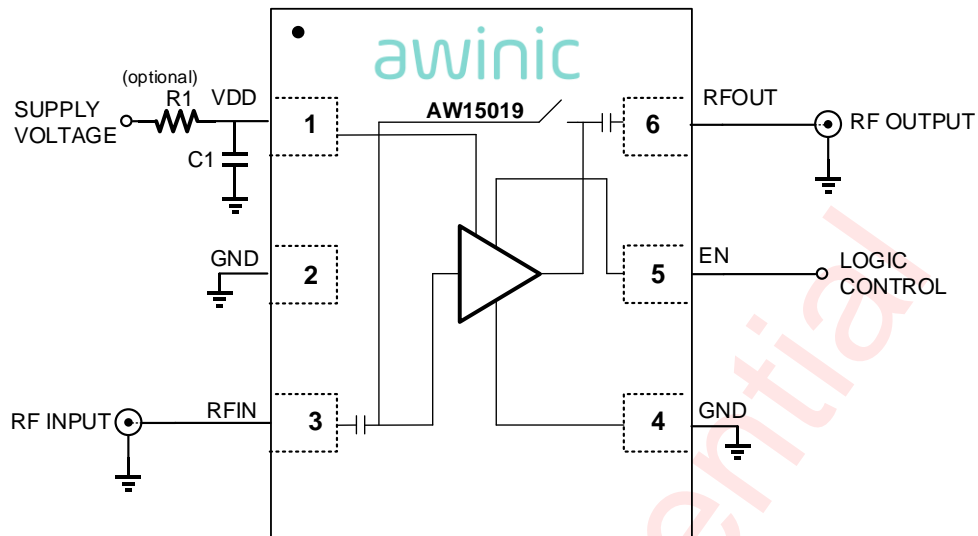
### General Description

The AW15019 is a Low Noise Amplifier with bypass switch designed for 2.4GHz ISM Band application. With on-chip DC blocking capacitors at RFIN and RFOUT, the AW15019 can be close to the antenna. The AW15019 doesn't requires any external matching inductor, which can reduce assembly complexity and the PCB area, enabling a cost-effective solution.

The AW15019 with patented Smart Linearity Technology (SLT) achieves low noise figure, high linearity, high gain, over a wide range of supply voltages from 1.65 V up to 1.95 V. All these features make AW15019 an excellent choice for wireless transceiver solutions with ISM band as it improves sensitivity with low noise figure and high gain, provides better immunity against out-of-band jammer signals with high linearity, reduces filtering requirement of preceding stage and hence reduces the overall cost of the transceiver.

The AW15019 is available in a small lead-free, RoHS-Compliant, FCDFN 1.1 mm X 0.9 mm X 0.37 mm-6L package.

## Typical Application Circuit



Typical Application Circuit of AW15019

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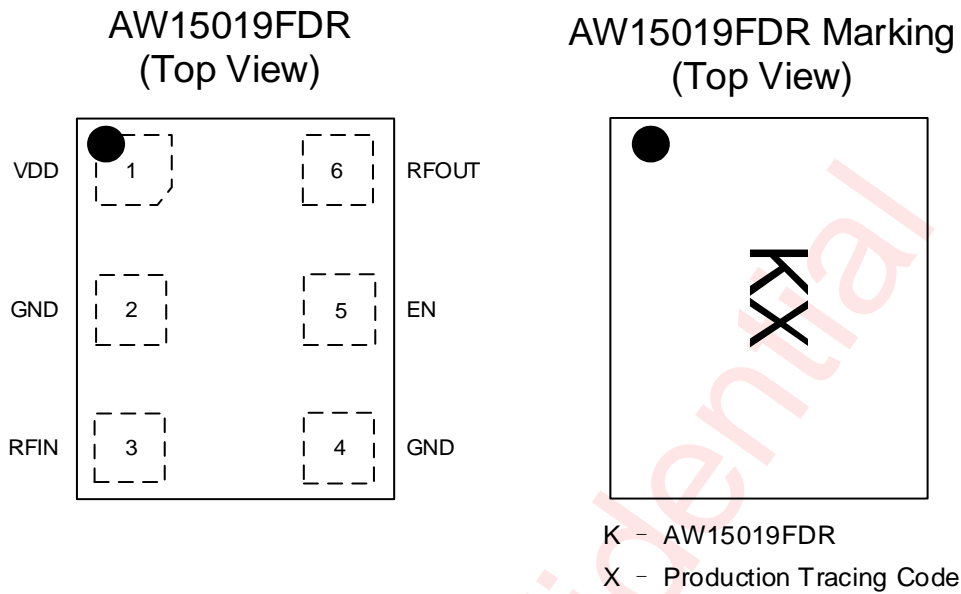
## Recommended Components List

Table1 list the recommended components types and values.

Table1: list of components

Component	Part Number	Capacitance	Rated Voltage	Supplier	Size
C1	GRM155	1nF	50V	Murata	0402

## Pin Configuration And Top Mark

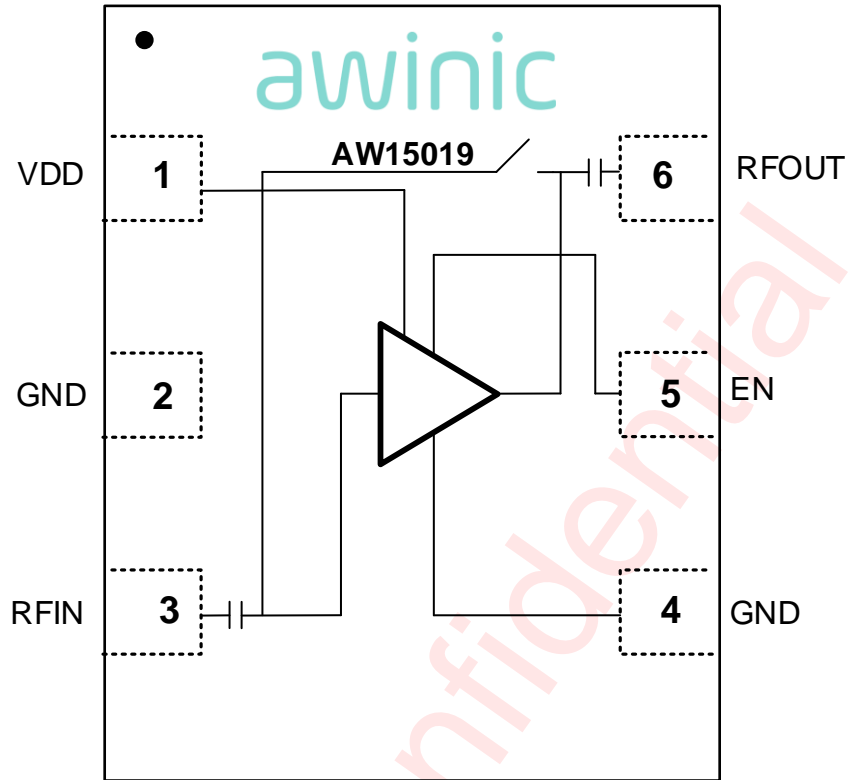


Pin Configuration and Top Mark

## Pin Definition

No.	NAME	DESCRIPTION
1	VDD	DC Supply
2	GND	Ground
3	RFIN	LNA input
4	GND	Ground
5	EN	Logic control
6	RFOUT	LNA output

### Functional Block Diagram



Functional Block Diagram

### Ordering Information

Part Number	Temperature	Package	Marking	Moisture Sensitivity Level	Environmental Information	Delivery Form
AW15019FDR	-40°C ~ 85°C	FCDFN 1.1 mm X 0.9 mm X 0.37 mm-6L	K	MSL1	ROHS+HF	4500 units/ Tape and Reel

Absolute Maximum Ratings<sup>[1]</sup>

PARAMETERS	Symbol	Values			Unit
		Min.	Typ.	Max.	
Supply Voltage at pin VCC	VCC	-0.3	-	3.6	V
Voltage at pin EN <sup>[2]</sup>	V <sub>EN</sub>	-0.3	-	3.6	V
Current into pin VCC	I <sub>CC</sub>	-	-	10	mA
RF input power in RX mode <sup>[3]</sup>	P <sub>IN@RX</sub>	-	-	15	dBm
RF output power in RX mode(@1.8V) <sup>[3]</sup>	P <sub>OUT</sub>	-	-	10	dBm
RF input power in TX mode <sup>[3]</sup>	P <sub>IN@TX</sub>	-	-	26	dBm
Junction temperature	T <sub>J</sub>	-	-	150	°C
Storage temperature range	T <sub>STG</sub>	-65	-	150	°C
Ambient temperature range	T <sub>amb</sub>	-40	-	85	°C
Solder temperature(10s)		-	260	-	°C
ESD range					
HBM <sup>[4]</sup>			±1		kV
CDM <sup>[5]</sup>			±0.5		kV

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: Warning: due to internal ESD diode protection, the applied DC voltage should not exceed 3.6V in order to avoid excess current.

NOTE3: The RF input and RF output are AC coupled through internal DC blocking capacitor.

NOTE4: HBM standard: ESDA/JEDEC JS-001-2017.

NOTE5: CDM standard: ESDA/JEDEC JS-002-2018.

## Electrical Characteristics

AW15019 EVB; Typical values are  $V_{CC}=1.8\text{ V}$  and  $T_A=25^\circ\text{C}$ ,  $f=2450\text{MHz}$ , unless otherwise noted

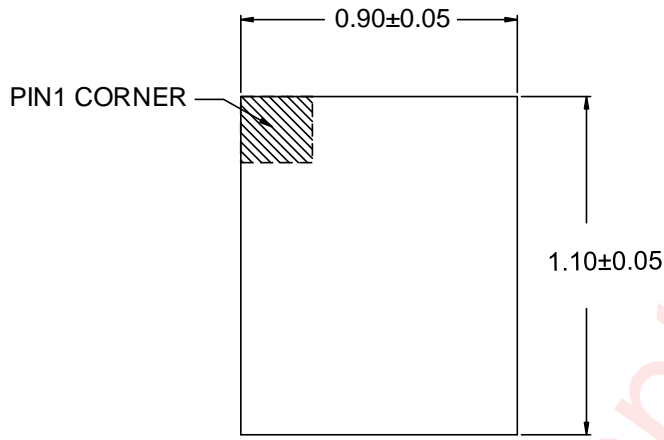
PARAMETER	TEST CONDITION	MIN	TYP	MAX	UNIT	
<b>DC ELECTRICAL CHARACTERISTICS</b>						
$V_{CC}$	Supply Voltage	1.65	-	1.95	V	
$I_{TX}$	TX Current	EN=Low	-	10	30	$\mu\text{A}$
$I_{RX}$	RX Current	EN=High	-	2.7	4.2	mA
$V_{EN}$	Digital Input-Logic High	1.0	-	-	V	
$V_{EN}$	Digital Input-Logic Low	-	-	0.4	V	
$I_{EN}$	Control current	EN=1.8V	-	-	7	$\mu\text{A}$
		EN=0.4V	-	-	5	$\mu\text{A}$
<b>AC ELECTRICAL CHARACTERISTICS(Rx Mode)</b>						
$G_p$	Power Gain	EN=High	10.5	14	16.5	dB
$G_{(Var)}$	Gain Variation	EN=High	-2	-	2	dB
$G_{(flat)}$	Gain flatness (Over any 2MHz BW)	EN=High	-0.25	-	0.25	dB
$RL_{in}$	Input Return Loss	EN=High	8	15	-	dB
$RL_{out}$	Output Return Loss	EN=High	8	13	-	dB
ISL	Reverse Isolation	EN=High	20	25	-	dB
$G_{p_{oob}}$	Out of Band Gain	824-915MHz	-	-12	-6.5	dB
		1710-1910MHz	-	7	14.5	dB
		2300-2370MHz	-	12	16.5	dB
		3400-4400MHz	-	7	12.5	dB
		5150-5825MHz	-	-6	-0.5	dB
		5925-7150MHz	-	-11	-5.5	dB
NF	Noise Figure <sup>[1]</sup>	Zs=50 ohm; No jammer	-	2.0	2.8	dB
$P_b$	Power of blocker (gain reduce 1dB)	824-915MHz	-10	-8	-	dBm
		1710-1910MHz	-14	-12	-	dBm
		2570-2620 MHz	-14	-12	-	dBm
		3400-4400MHz	-10	-8	-	dBm
		5150-7150 MHz	-10	-8	-	dBm
Kf	Stability factor	f=0.1-10GHz	1	-	-	
IP1dB	Inband input 1dB-compression point	f=2450MHz	-12	-4	-	dBm
IIP3 <sub>ib</sub>	Inband input 3 <sup>rd</sup> -order intercept point <sup>[2]</sup>	f1=2450MHz; f2=2451MHz;	-5	0	-	dBm
$t_{on}$	turn-on time	Tx to Rx	-	0.8	1.2	$\mu\text{s}$
$t_{off}$	turn-off time	Rx to Tx	-	0.2	1	$\mu\text{s}$
<b>AC ELECTRICAL CHARACTERISTICS(Tx Mode)</b>						
IL	Insertion loss	EN=Low	-	0.8	1.0	dB

PARAMETER		TEST CONDITION	MIN	TYP	MAX	UNIT
IL <sub>(flat)</sub>	Flatness	Over any 1MHz BW	-0.1	-	0.1	dB
RL <sub>in</sub>	Input Return Loss	EN=Low	9	12	-	dB
RL <sub>out</sub>	Output Return Loss	EN=Low	9	12	-	dB
IPO.1dB	0.1dB Compression Point	f=2450MHz	21	25	-	dBm
IIP3	Inband input 3rd-order intercept point	20MHz two tone space, Pin=18dBm/per tone, in-band	35	-	-	dBm
2f <sub>0</sub>	Second Harmonics	f <sub>0</sub> =2450MHz Pin=18dBm, CW VSWR=1:1	-	-50	-40	dBm
2f <sub>0</sub>	Second Harmonics	f <sub>0</sub> =2450MHz Pin=18dBm, CW VSWR=5:1	-	-42	-36	dBm
3f <sub>0</sub>	Third Harmonics	f <sub>0</sub> =2450MHz Pin=18dBm, CW VSWR=1:1	-	-52	-40	dBm
3f <sub>0</sub>	Third Harmonics	f <sub>0</sub> =2450MHz Pin=18dBm, CW VSWR=5:1	-	-39	-36	dBm
Spurious	All spurious	f <sub>0</sub> =2450MHz Pin=18dBm, CW VSWR=1:1	-	-	-40	dBm
Spurious	All spurious	f <sub>0</sub> =2450MHz Pin=18dBm, CW VSWR=5:1	-	-	-36	dBm

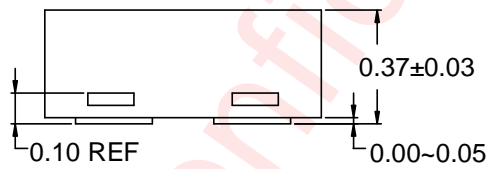
NOTE1: PCB losses are subtracted.

NOTE2: Input power = -20 dBm for each tone

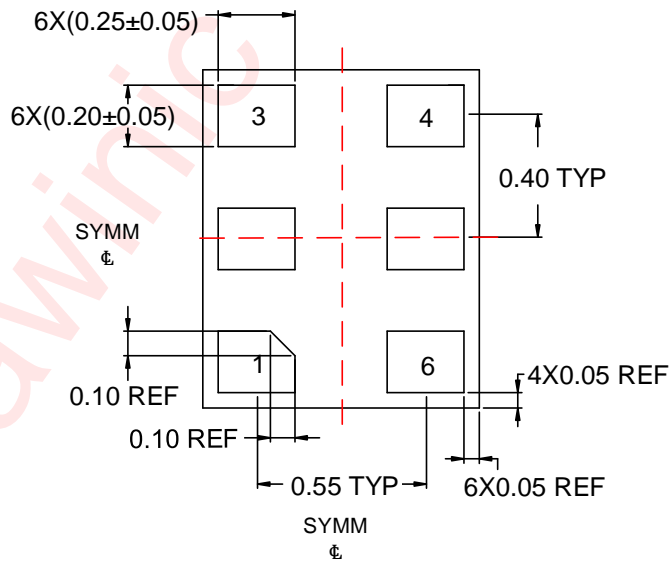
Package Description



Top View



Side View

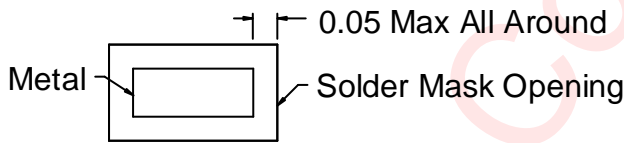
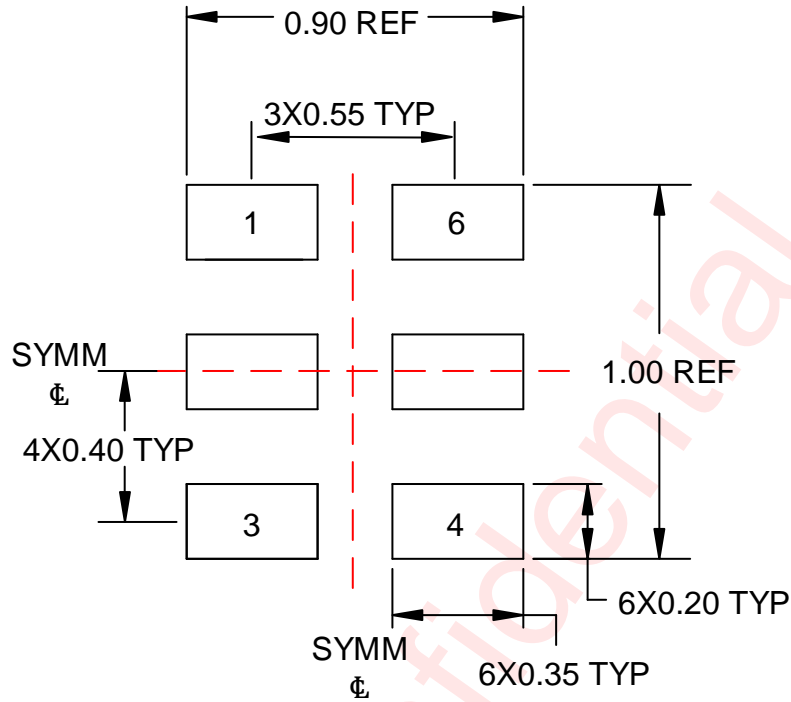


Bottom View

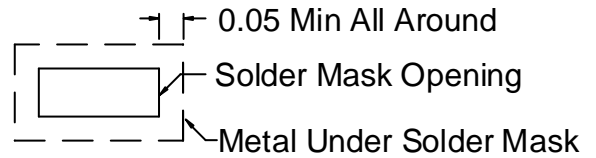
Unit:mm

Package Outline

Land Pattern



Non-solder Mask Defined

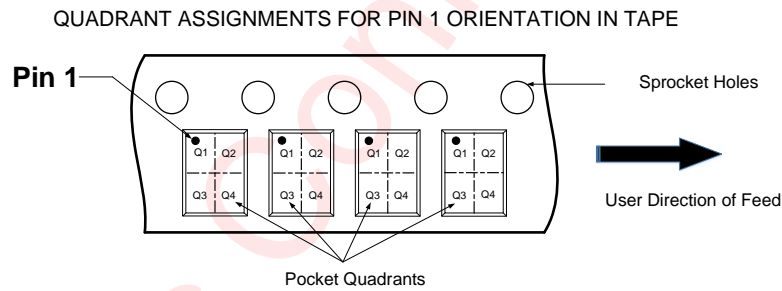
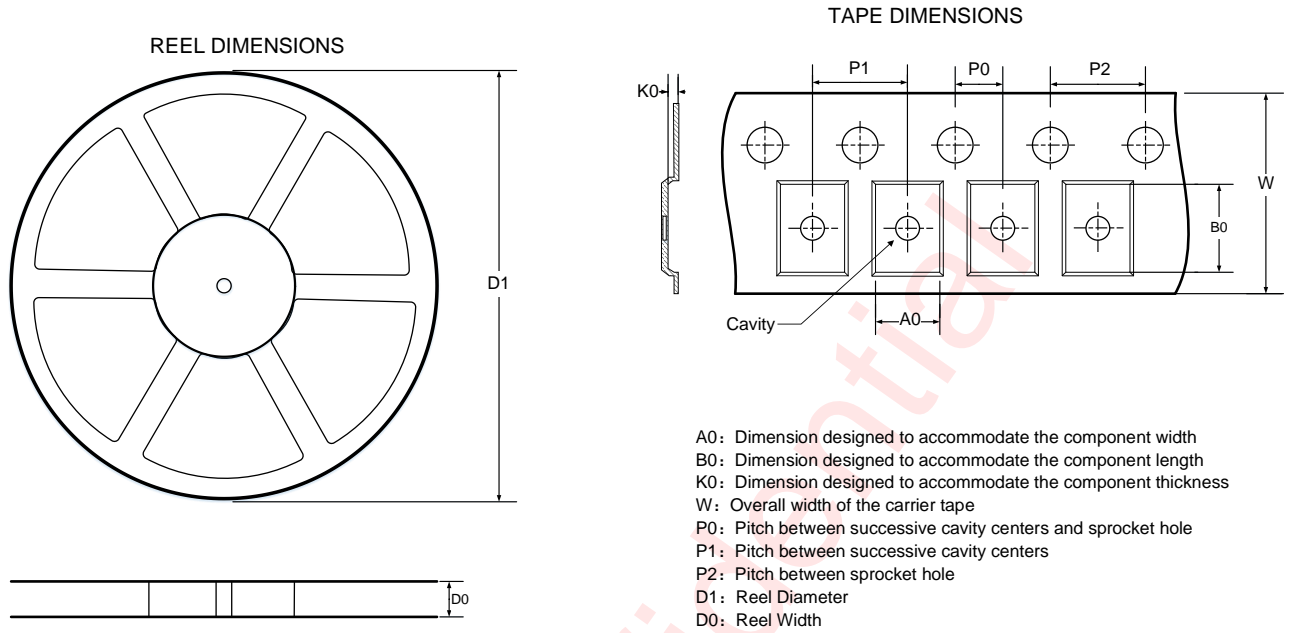


Solder Mask Defined

Unit:mm

Land Pattern

### Tape & Reel Description



Note: The above picture is for reference only. Please refer to the value in the table below for the actual size

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	1.05	1.25	0.5	2	4	4	8	Q1

All dimensions are nominal

### Tape & Reel Description

## Revision History

Version	Date	Change Record
V1.0	Nov. 2020	Officially Released
V1.1	Apr. 2021	Update $P_{IN}$ , $I_{RX}$ , $V_{EN}$ , NF and $t_{on}$ ; Add 2f0 and 3f0 for VSWR=5:1
V1.2	June. 2021	Update $I_{RX}$ , IL, NF, IP1dB, $G_{p_{oob}}$
V1.3	Jan. 2022	Update $I_{RX}$ , Gp, $G_{p_{oob}}$ , IP1dB
V1.4	Aug. 2022	Update format

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