

## Features

- Frequency Range 4.9 GHz to 5.9 GHz
- Supply-voltage 2.7 V to 3.6 V
- 3.5% EVM at 19 dBm Output Power at 54 Mbit/s OFDM
- 25.5 dBm  $P_{1dB}$
- On-chip Power Detector with 25 dBm Dynamic Range
- Power-down Mode and Biasing Control
- Low Profile Lead-free Plastic Package QFN16 ( $4 \times 4 \times 0.9$  mm)

## Applications

- IEEE 802.11a OFDM WLAN
- Hiperlan2 WLAN
- PC Cards, PCMCIA
- 5 GHz ISM Band Application

Electrostatic sensitive device.  
Observe precautions for handling.



## Description

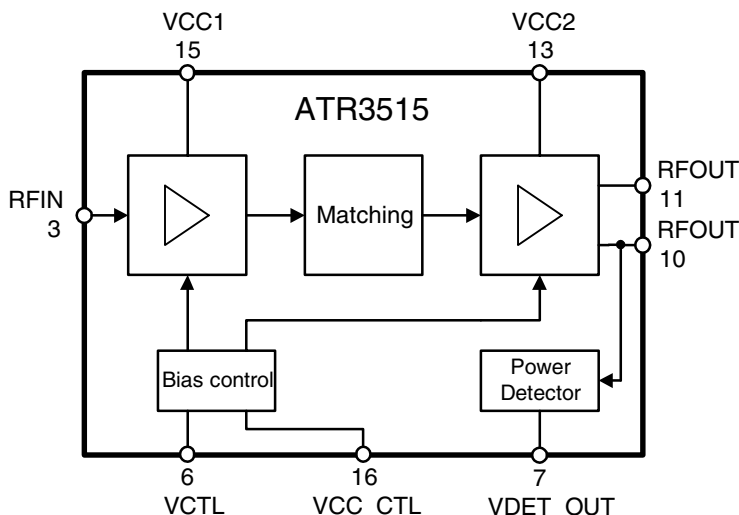
### Process

The 5-GHz power amplifier is designed in Atmel's advanced Silicon-Germanium (SiGe) process and provides excellent linearity and noise performance as well as good power-added efficiency.

### Circuitry

The PA consists of a two-stage amplifier with a  $P_{1dB}$  of 25.5 dBm. The output stage was realized using an open-collector structure. Power-up/down and output level are controlled at bias control pin 6 (VCTL). An on-chip power detector provides a voltage proportional to the output power.

Figure 1. Block Diagram



## 5-GHz WLAN Power Amplifier for 802.11a

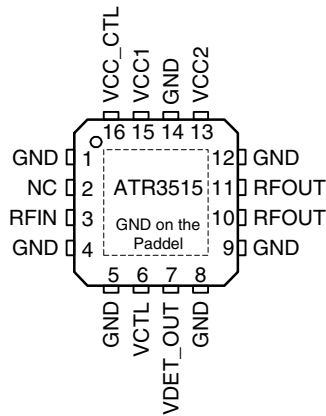
## ATR3515

## Preliminary



## Pin Configuration

Figure 2. Pinning QFN16



## Pin Description

Pin	Symbol	Function
1	GND	Ground
2	NC	Not connected
3	RFIN	RF input
4	GND	Ground
5	GND	Ground
6	VCTL	Power-up/biasing control voltage
7	VDET_OUT	Power detector output voltage
8	GND	Ground
9	GND	Ground
10	RFOUT	RF output
11	RFOUT	RF output
12	GND	Ground
13	VCC2	Supply voltage for PA stage
14	GND	Ground
15	VCC1	Supply voltage for driver stage
16	VCC_CTL	Supply voltage for biasing control
Paddel	–	Ground

## Absolute Maximum Ratings

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Parameters	Symbol	Value	Unit
Supply voltage	$V_{CC}$	3.9	V
Supply current	$I_{CC}$	800	mA
Junction temperature	$T_j$	150	°C
Storage temperature	$T_{Stg}$	-40 to +125	°C
Input RF power	$P_{IN}$	12	dBm
Control voltage power up/down and biasing	$V_{CTL}$	0 to 2.0	V

Note: The part may not survive all maximums applied simultaneously.

## Operating Range

Parameters	Symbol	Value	Unit
Supply voltage range	$V_{CC}$	2.7 to 3.6	V
Ambient temperature range	$T_{amb}$	-25 to +75	°C

## Electrical Characteristics

No.	Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
1.0	Supply voltage		$V_{CC}$	2.7	3.3	3.6	V
1.1	Frequency range		f	4.9		5.9	GHz
1.2	Control voltage range	PA operating mode	$V_{CTL}$	1.25		1.6	V
1.3		Power down mode	$V_{CTL}$			0.2	V
1.4	Control current	PA Operation	$I_{CTL}$			200	μA
1.5	Current consumption	Quiescent	$I_{cq}$		110		mA
1.6	Current consumption	Power down mode	$I_{pd}$			10	μA
1.7	Turn on/off time	ON is the time that $I_{CC}$ returns to normal and OFF is the time the current needs to decrease to 10% of normal mode	$t_{on/off}$		0.5	0.6	μs
1.8	Input and output return loss	With external matching			-12	-8	dB
1.9	Spectrum mask <sup>(1)</sup>	At ±11 MHz offset from carrier				-22	dBr
1.10		At ±20 MHz offset from carrier				-30	dBr
1.11		At ±30 MHz offset from carrier					-42

Note: 1. OFDM signal according to 802.11a specification with  $P_{out} = 21$  dBm at 54 Mbps.

## Electrical Characteristics - Unmodulated Carrier

Test Conditions (unless otherwise stated):  $V_{CC} = 3.3\text{ V}$ , Frequency = 5.25 GHz,  $T_{amb} = 25^\circ\text{C}$

No.	Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
2.0	Saturated output power	For reference	$P_{sat}$		26.5		dBm
2.1	P1dB output power		$P_{1dB}$		25.5		dBm
2.3	Small signal gain	$I_{cq} = 180\text{ mA}$ , small signal condition	GL		18		dB
2.4	Gain deviation	Within 200 MHz frequency band	Gd	-1		+1	dB
2.5	Reverse isolation		ISOr	30	36		dB

## Electrical Characteristics - 54 Mbps OFDM-modulation

Test Conditions (unless otherwise stated):  $V_{CC} = 3.3\text{ V}$ , Frequency = 5.25 GHz,  $T_{amb} = 25^\circ\text{C}$ , IEEE802.11a conform 54 Mbps OFDM modulation, EVM measurement equipment noise floor is included in EVM measurement result.

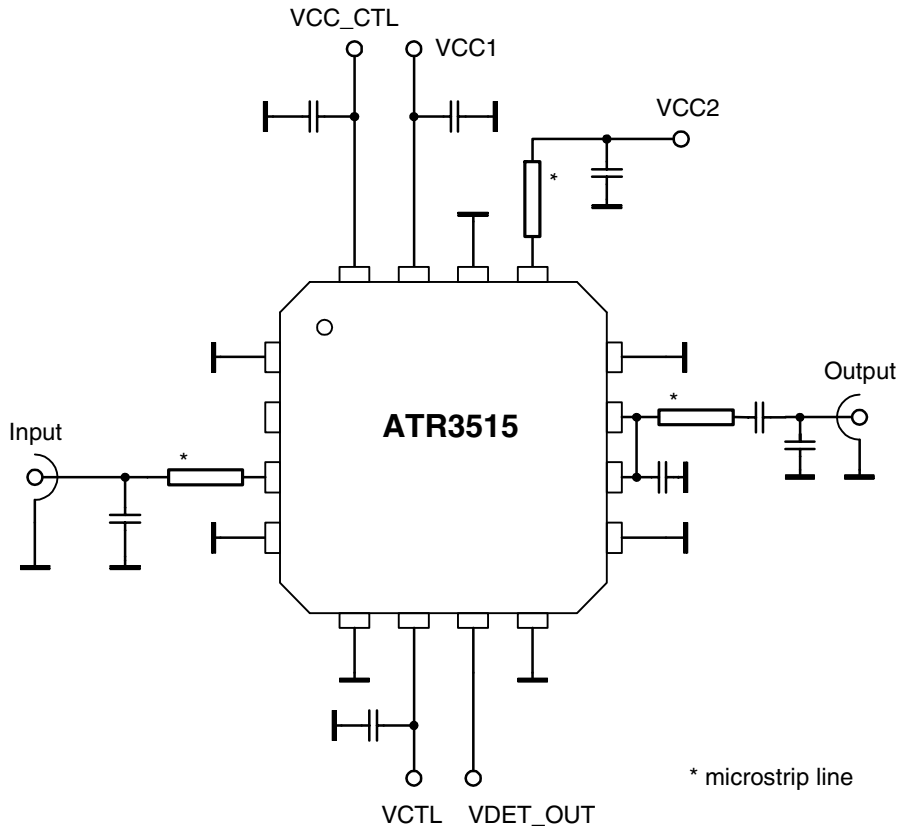
No.	Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
3.0	Error vector magnitude	$P_{OUT} = 19\text{ dBm}$	EVM		3.5		%
3.1	Linear power gain	$P_{OUT} = 19\text{ dBm}$	GL		18		dB
3.2	Current consumption	$P_{OUT} = 19\text{ dBm}$	$I_{CC}$		240		mA

## Electrical Characteristics - Power Detector

Test Conditions (unless otherwise stated):  $V_{CC} = 3.3\text{ V}$ , Frequency = 5.25 GHz,  $T_{amb} = 25^\circ\text{C}$ .

No.	Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
4.0	Detector voltage range	$P_{OUT} = 2\text{ to }27\text{ dBm}$	$V_{DET}$	0		1.7	V
4.2	Settling time		tset		0.5		$\mu\text{s}$

Figure 3. Application Circuit



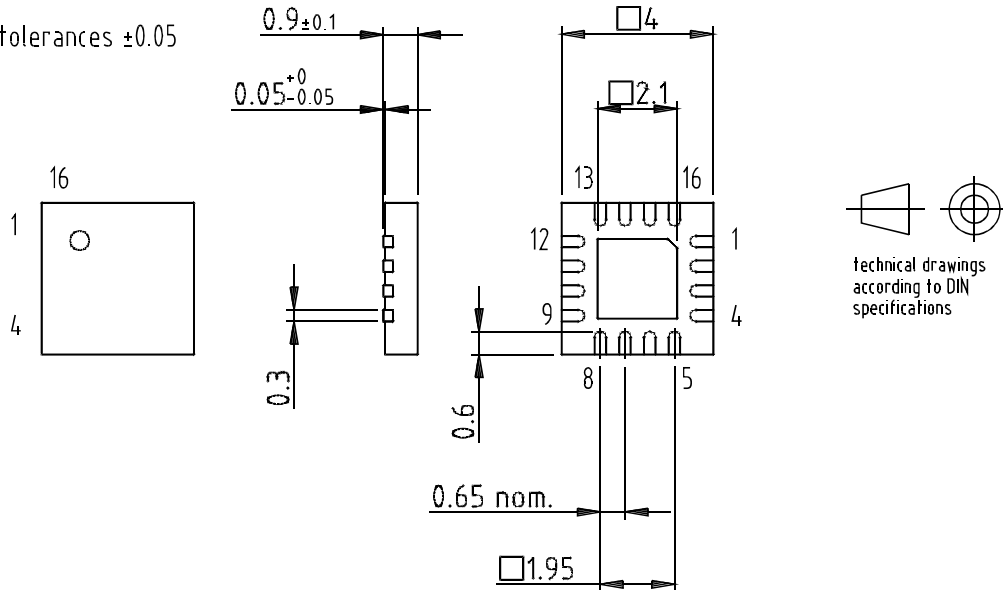
## Ordering Information

Extended Type Number	Package	Remarks
ATR3515-PEP	QFN16 - 4x4	Taped and reeled, MOQ 1500
ATR3515-PEQ	QFN16 - 4x4	Taped and reeled, MOQ 6000

## Package Information

Package: QFN 16 - 4x4  
 Exposed pad 2.1x2.1  
 (acc. JEDEC OUTLINE No. MO-220)  
 Dimensions in mm

Not indicated tolerances  $\pm 0.05$



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## Atmel Corporation

2325 Orchard Parkway  
San Jose, CA 95131, USA  
Tel: 1(408) 441-0311  
Fax: 1(408) 487-2600

## Regional Headquarters

### Europe

Atmel Sarl  
Route des Arsenaux 41  
Case Postale 80  
CH-1705 Fribourg  
Switzerland  
Tel: (41) 26-426-5555  
Fax: (41) 26-426-5500

### Asia

Room 1219  
Chinachem Golden Plaza  
77 Mody Road Tsimshatsui  
East Kowloon  
Hong Kong  
Tel: (852) 2721-9778  
Fax: (852) 2722-1369

### Japan

9F, Tonetsu Shinkawa Bldg.  
1-24-8 Shinkawa  
Chuo-ku, Tokyo 104-0033  
Japan  
Tel: (81) 3-3523-3551  
Fax: (81) 3-3523-7581

## Atmel Operations

### Memory

2325 Orchard Parkway  
San Jose, CA 95131, USA  
Tel: 1(408) 441-0311  
Fax: 1(408) 436-4314

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2325 Orchard Parkway  
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Tel: 1(408) 441-0311  
Fax: 1(408) 436-4314

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Fax: (33) 2-40-18-19-60

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Fax: (33) 4-42-53-60-01

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Colorado Springs, CO 80906, USA  
Tel: 1(719) 576-3300  
Fax: 1(719) 540-1759

Scottish Enterprise Technology Park  
Maxwell Building  
East Kilbride G75 0QR, Scotland  
Tel: (44) 1355-803-000  
Fax: (44) 1355-242-743

### RF/Automotive

Theresienstrasse 2  
Postfach 3535  
74025 Heilbronn, Germany  
Tel: (49) 71-31-67-0  
Fax: (49) 71-31-67-2340

1150 East Cheyenne Mtn. Blvd.  
Colorado Springs, CO 80906, USA  
Tel: 1(719) 576-3300  
Fax: 1(719) 540-1759

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