2.9 GHz to 5.8 GHz SiGe Frequency Doubler IC

ATR7039

Preliminary

Features

- **Input Frequency Range 2.7 GHz to 3.0 GHz**
- **P_{OUT} Typically 12 dBm at 5.8 GHz**
- **P_{IN} Typically 0 dBm**
- **V_{CC} 3.0V to 3.9V**
- **CW Mode Operation**
- **Package: QFN16**

Benefits

- **Ramping Control Extends Battery Lifetime**
- **AC Input Coupling Saves External Capacitors**
- **Extremely Low BOM for Application**

Electrostatic sensitive device.
Observe precautions for handling.

1. Description

The 5.8-GHz frequency doubler IC is designed with Atmel's Silicon-Germanium (SiGe) process and provides a high conversion gain.

The device consists of a doubler stage, a filter and a driver amplifier with an output power of 11 dBm. The output stage was realized using an open-collector structure. Power-up/down and output levels are controlled via the bias control pin 6 and pin 7 (V_{CTL}).

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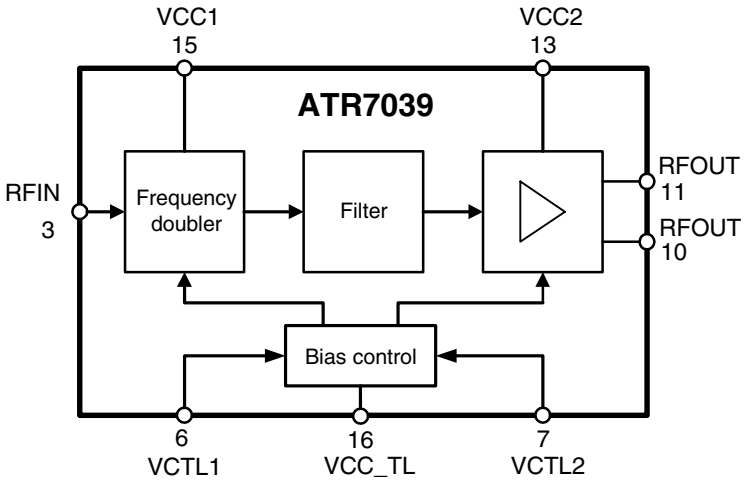
Figure 1-1. Block Diagram



2. Pin Configuration

Figure 2-1. Pinning QFN16

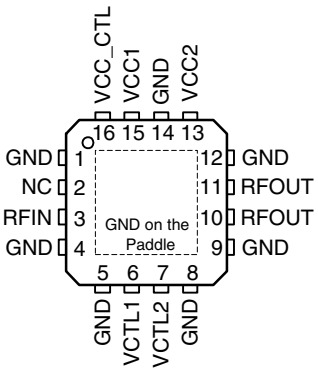


Table 2-1. Pin Description

Pin	Symbol	Function
1	GND	Ground
2	NC	Not connected
3	RFIN	RF input
4	GND	Ground
5	GND	Ground
6	VCTL1	Power-up/biasing control voltage to frequency doubler stage
7	VCTL2	Power-up/biasing control voltage to output amplifier stage
8	GND	Ground
9	GND	Ground
10	RFOUT	RF output
11	RFOUT	RF output
12	GND	Ground
13	VCC2	Supply voltage for output amplifier stage
14	GND	Ground
15	VCC1	Supply voltage for frequency doubler stage
16	VCC_CTL	Supply voltage for biasing control
Paddle	–	Ground

3. 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, no RF	V_{CC}	5	V
Supply current	I_{CC}	400	mA
Junction temperature	T_j	150	°C
Storage temperature	T_{Stg}	–40 to +125	°C
Input RF power	P_{IN}	13	dBm
Control voltage	$V_{CTL1,2}$	2.5	V

Note: The part may not survive all parameters at maximum applied simultaneously!

4. Thermal Resistance

Parameters	Symbol	Value	Unit
Junction ambient QFN16 package, slug soldered on PCB	R_{thJA}	40	K/W

5. Operating Range

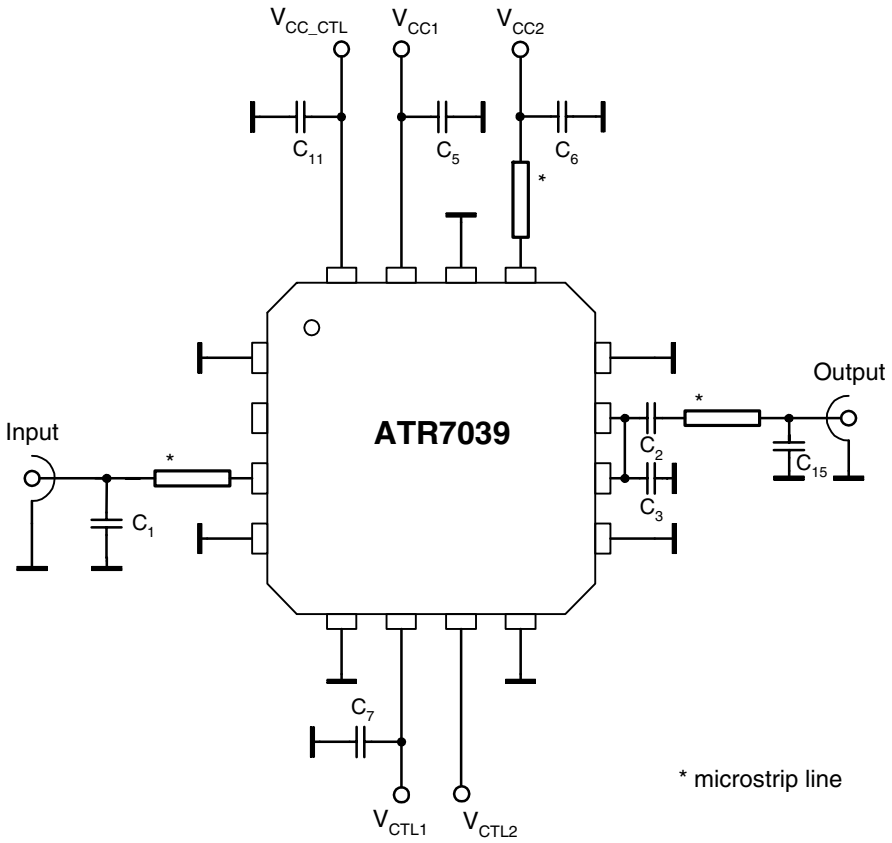
Parameters	Symbol	Value	Unit
Supply voltage	V_{CC}	3.0 to 3.9	V
Input frequency range	f_{in}	2700 to 3000	MHz
Output frequency range	f_{out}	5400 to 6000	MHz
Ambient temperature range	T_{amb}	–25 to +75	°C

6. Electrical Characteristics

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
1.0	Input power		3	Pin		0	10	dBm	A
1.1	Output power	Measured at harmonic frequency 2f	10, 11	P2f		12		dBm	A
1.2		Measured at harmonic frequency 3f	10, 11	P3f		-8		dBm	A
1.3		Measured at fundamental frequency	10, 11	P1f		TBD		dBm	A
1.4	Output power deviation	Measured at harmonic frequency	10, 11	P_d	–2		+2	dB	A
1.5	Control voltage range	Doubler operating mode	6	V_{CTL1}		1.4		V	A
			7	V_{CTL2}		1.7		V	A
1.6		Power down mode	6, 7	$V_{CTL1,2}$			0.2	V	A
1.7	Input and output return loss	With external matching	3, 10, 11			–12	–8	dB	C
1.8	Reverse isolation	2f	3, 10, 11	ISO_r	30	36		dB	C
1.9	Current consumption	for 12dBm output power	13, 15, 16	I_{CC}		90		mA	A
1.10	Current consumption in power down mode	$V_{CTL1,2} \leq 0.2V$	13, 15, 16	I_{CC}		15		µA	A
2.0	Duty cycle						100	%	C

*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

7. Application Circuit



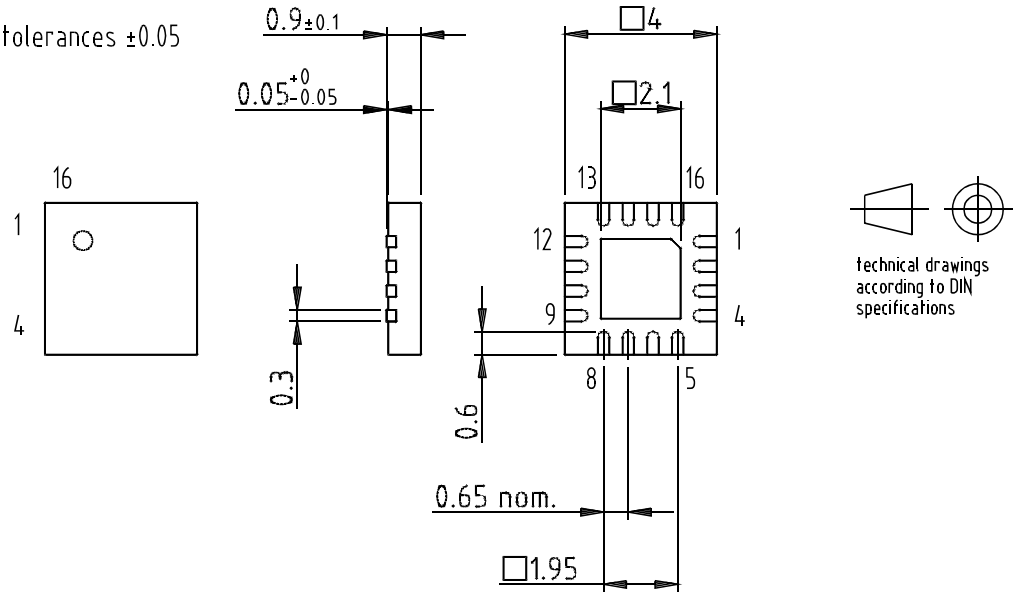
8. Ordering Information

Extended Type Number	Package	Remarks
ATR7039-PESG	QFN16 - 4x4	Tube, MOQ 750, Pb-free
ATR7039-PEQG	QFN16 - 4x4	Taped and reeled, MOQ 6000, Pb-free

9. Package Information

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

Not indicated tolerances ±0.05



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