

Features

- Frequency Range 5 GHz to 6 GHz
- P_{out} 25 dBm at 5.8 GHz
- Gain Typically 30 dB
- P_{in} Typically 0 dBm
- V_{CC} 2.7V to 3.8V
- Power Consumption in Power-down Mode Typically $< 1 \mu A$
- Package: QFN16 3 mm \times 3 mm

Benefits

- Biasing Control Extends Battery Time
- Simple Input and Output Matching
- Only One Single Supply Required
- No High-side Switching Transistor Required

1. Description

1.1 Process

This 5-GHz power amplifier (PA) is designed using Atmel's Silicon-Germanium (SiGe) process and provides high efficiency.

1.2 Circuitry

The PA, ATR7040, consists of a three-stage amplifier with a typical output power of 25 dBm. The output stage was implemented using an open-collector structure. Power up, power down, and output level are controlled at bias control pin 6 (V_{ctl}).

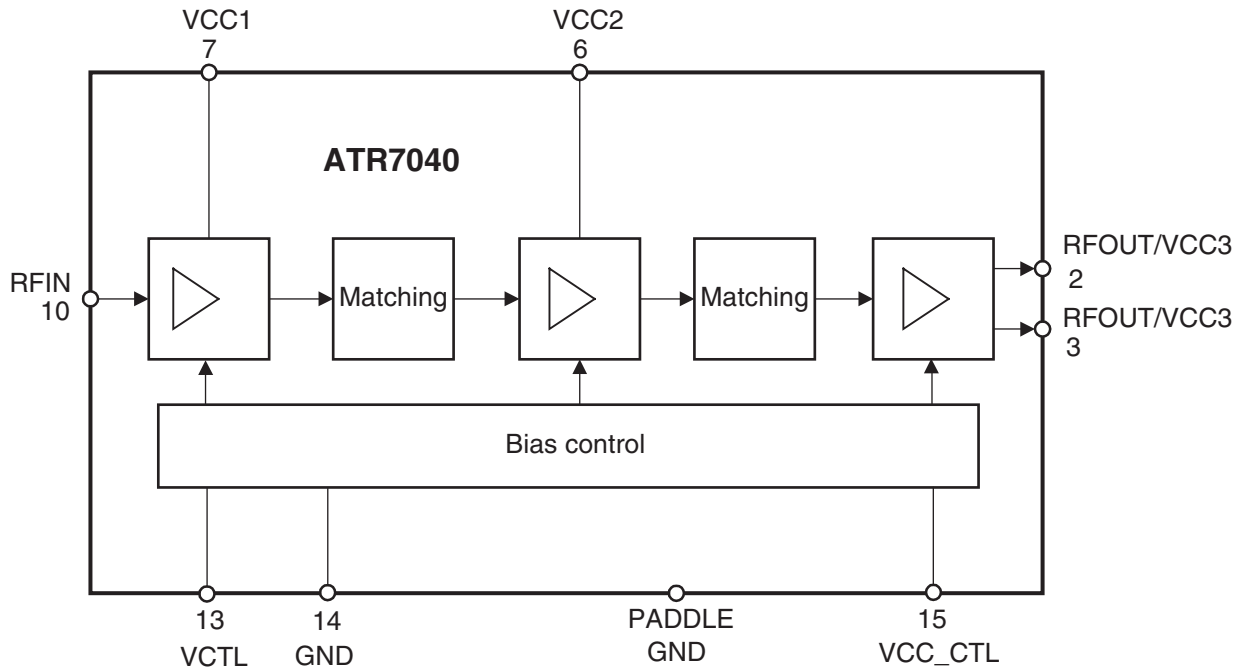


5.8 GHz WDCT Power Amplifier

ATR7040



Figure 1-1. Block Diagram



2. Pin Configuration

Figure 2-1. Pinning QFN16

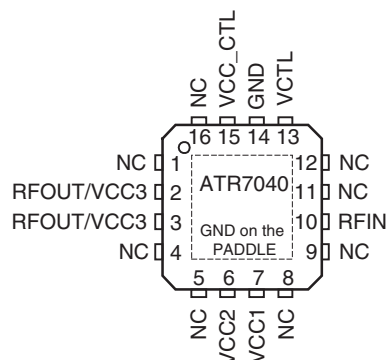


Table 2-1. Pin Description

| Pin | Symbol | Function |
|--------|---------|---|
| 1 | NC | Not connected ⁽¹⁾ |
| 2 | RFOUT | RF output and supply voltage for output amplifier stage |
| 3 | RFOUT | RF output and supply voltage for output amplifier stage |
| 4 | NC | Not connected ⁽¹⁾ |
| 5 | NC | Not connected ⁽¹⁾ |
| 6 | VCC2 | Supply voltage for second amplifier stage |
| 7 | VCC1 | Supply voltage for first amplifier stage |
| 8 | NC | Not connected ⁽¹⁾ |
| 9 | NC | Not connected ⁽¹⁾ |
| 10 | RFIN | RF input |
| 11 | NC | Not connected ⁽¹⁾ |
| 12 | NC | Not connected ⁽¹⁾ |
| 13 | VCTL | Control voltage for power ramping |
| 14 | GND | Ground |
| 15 | VCC_CTL | Supply voltage for biasing control block |
| 16 | NC | Not connected ⁽¹⁾ |
| PADDLE | – | Ground |

Note: 1. Pin can be connected to paddle for increased GND area

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 | 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} | 10 | dBm |
| Control voltage | V_{ctl} | 2.5 | V |

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

Electrostatic sensitive device.
Observe precautions for handling.



4. Thermal Resistance

| Parameters | Symbol | Value | Unit |
|---|------------|-------|------|
| Junction ambient package QFN16, 3 × 3, slug soldered on PCB | R_{thJA} | 40 | K/W |

5. Operating Range

| Parameters | Symbol | Value | Unit |
|---------------------------|-----------|--------------|------|
| Supply voltage | V_{CC} | 2.7 to 3.8 | V |
| Operating frequency range | f_{in} | 5100 to 5900 | MHz |
| Ambient temperature range | T_{amb} | -25 to +75 | °C |

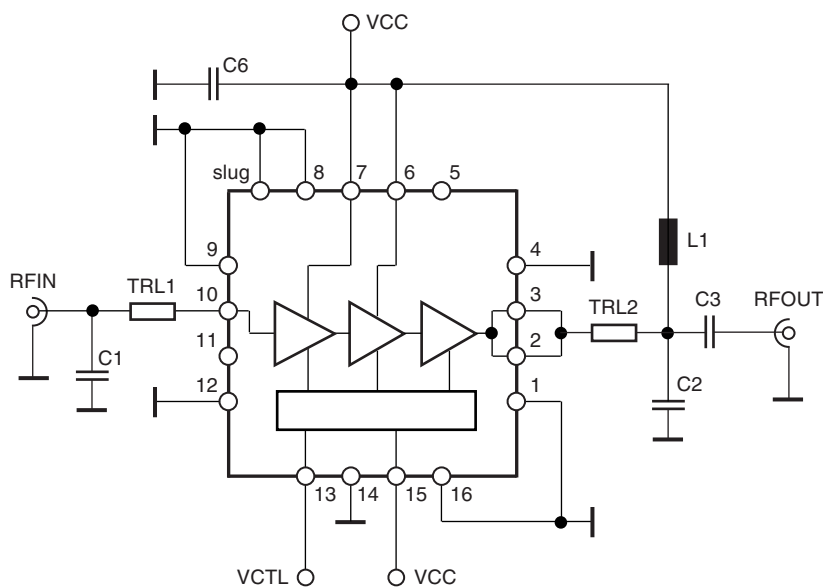
6. Electrical Characteristics

Operating conditions: $V_{CC} = 3.6V$, $V_{ctl} = 1.5V$, input frequency = 5.8 GHz, input power 0 dBm, pulsed mode, duty cycle 10%, $t_{on} = 1$ ms, $T_{amb} = 25^{\circ}C$, unless otherwise specified.

| No. | Parameters | Test Conditions | Pin | Symbol | Min. | Typ. | Max. | Unit |
|------|--|---------------------------------------|-----|-----------|------|------|------|---------|
| 1.0 | Frequency range | Depends on external circuitry | | | 5100 | | 5900 | MHz |
| 1.1 | Supply voltage | | | V_{CC} | 2.7 | 3.6 | 3.8 | V |
| 1.2 | Input power | | | P_{in} | | 0 | | dBm |
| 1.3 | Saturated power output | | | P_{sat} | | 25 | | dBm |
| 1.4 | Output power deviation | | | P_d | -2 | | +2 | dB |
| 1.5 | Control voltage range | PA operating mode | | V_{ctl} | 1.0 | | 1.7 | V |
| | | Power-down mode | | V_{ctl} | | | 0.2 | V |
| 1.6 | Control input current | PA on | 5 | I_{ctl} | | 90 | | μA |
| 1.7 | Input return loss | With external matching | 10 | | | -7 | -6 | dB |
| 1.8 | Isolation | $V_{ctl} \leq 0.2V$ | | ISO_r | 33 | 35 | | dB |
| 1.9 | Power added efficiency | At power saturation, $P_{in} = 0$ dBm | | PAE | | 35 | | % |
| 1.10 | Current consumption | For 25 dBm output power | | I_{cc} | | 250 | | mA |
| 1.11 | Current consumption in power-down mode | $V_{ctl} \leq 0.2V$ | | I_{cc} | | 1 | | μA |
| 1.12 | Duty cycle of operation | At saturated output power | | | | 100 | | % |

7. Application Circuit

Figure 7-1. Application Circuit



8. Diagrams

Figure 8-1. Output Power, Efficiency and Supply Currents Versus Input Frequency

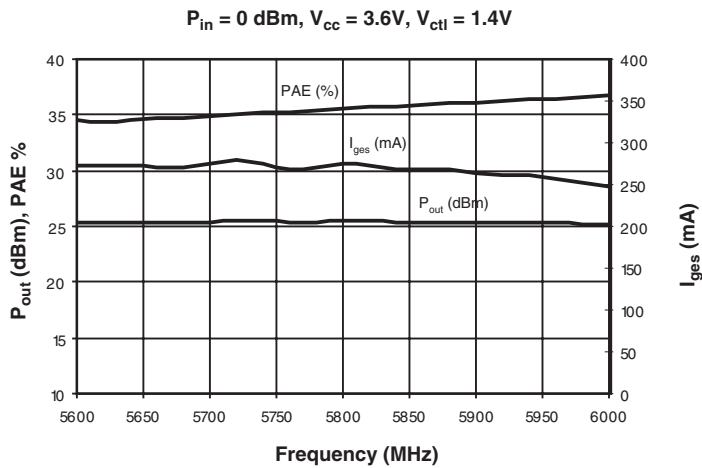


Figure 8-2. Output Power, Gain, Efficiency and Supply Currents Versus Input Power

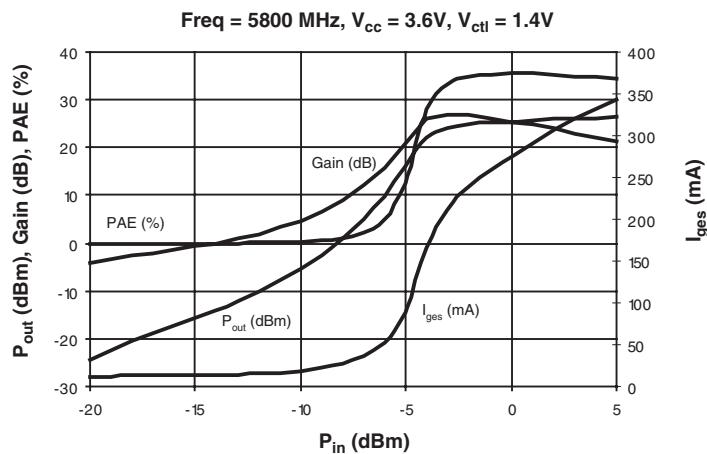
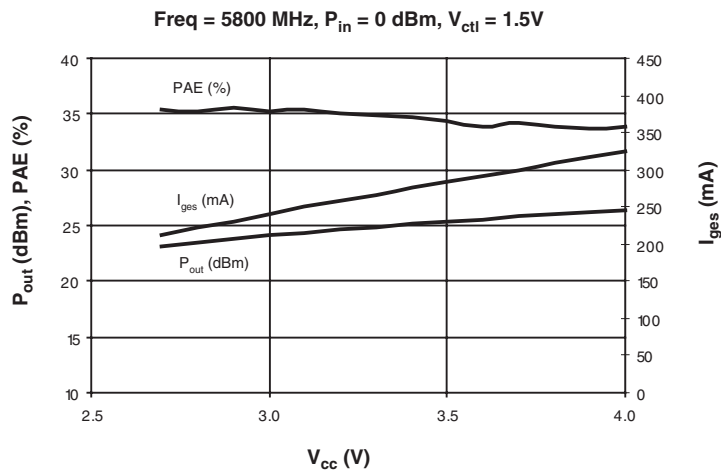


Figure 8-3. Output Power, Efficiency and Supply Currents Versus Operating Voltage



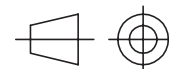
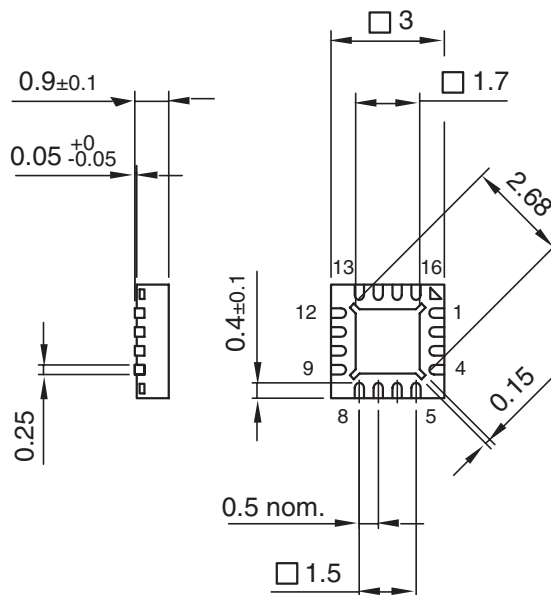
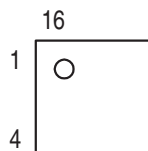
9. Ordering Information

| Extended Type Number | Package | Remarks |
|----------------------|--------------|-------------------------------------|
| ATR7040-PVPG | QFN16, 3 × 3 | Taped and reeled, MOQ 2000, Pb-free |
| ATR7040-PVQG | QFN16, 3 × 3 | Taped and reeled, MOQ 8000, Pb-free |

10. Package Information

Package: QFN 16 - 3x3
 Exposed pad 1.7x1.7
 (acc. JEDEC OUTLINE No. MO-220)
 Dimensions in mm

Not indicated tolerances ±0.05



technical drawings
 according to DIN
 specifications

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