



Features

- Single 3-V Supply Voltage
- Highly Efficient Power Amplifier (PAE Typically 40% at 23 dBm)
- Temperature Compensated Output Power
- Power Detector
- Internally Regulated Power Loop
- 4 Digitally Controlled Output Power Steps
- 6 dB Power Steps
- Current-saving Power-down Mode
- Few External Components
- Leadless 4 mm × 4 mm QFN16 Package

Electrostatic sensitive device.
Observe precautions for handling.



ISM 2.4 GHz Power Amplifier

T7025

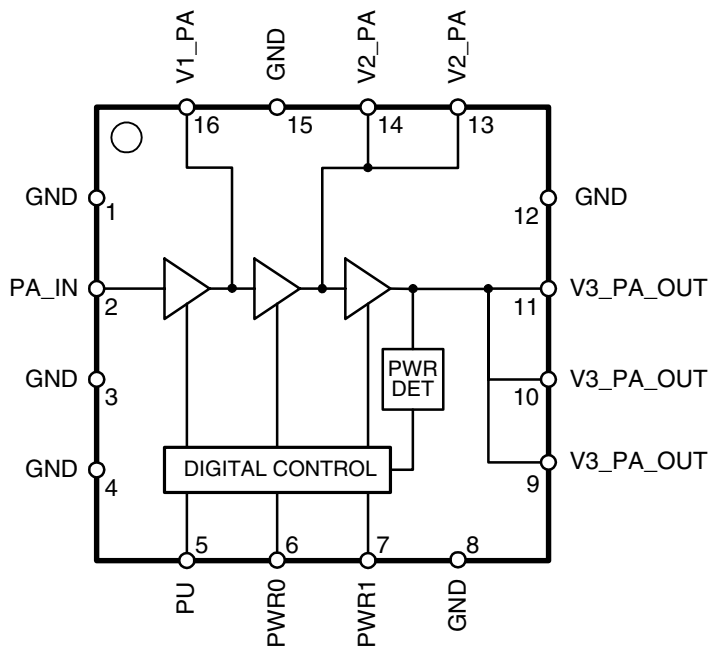
Preliminary

Description

The T7025 is a monolithic SiGe power amplifier. It is especially designed for operation in TDMA systems like Bluetooth™, Home RF and ISM proprietary radios.

The internally regulated power loop consists of a power detector, a temperature compensated gain amplifier and 2-bit logic. Due to the power-down mode no external switch transistor for V_S is required.

Figure 1. Block Diagram

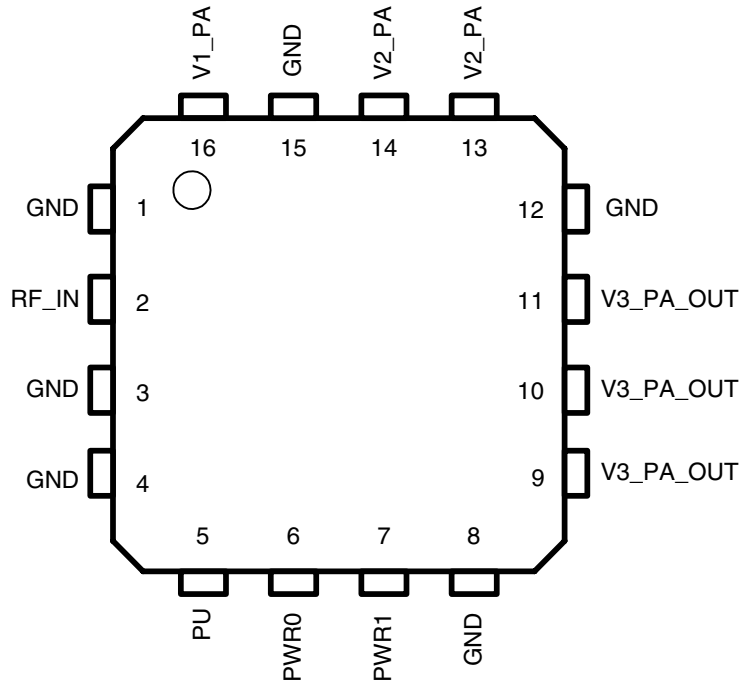


Rev. 4547A-ISM-02/03



Pin Configuration

Figure 2. Pinning QFN16



Pin Description

Pin	Symbol	Function	Configuration
1	GND	Ground	
2	PA_IN	Power amplifier input	
3	GND	Ground	
4	GND	Ground	
5	PU	Power up	
6	PWR0	Digital power control Bit 0	
7	PWR1	Digital power control Bit 1	
8	GND	Ground	

Pin Description (Continued)

Pin	Symbol	Function	Configuration
9	V3_PA_OUT	Supply voltage (third stage) and power amplifier output	
10	V3_PA_OUT	Supply voltage (third stage) and power amplifier output	
11	V3_PA_OUT	Supply voltage (third stage) and power amplifier output	
12	GND	Ground	
13	V2_PA	Supply voltage (second stage)	
14	V2_PA	Supply voltage (second stage)	
15	GND	Ground	
16	V1_PA	Supply voltage (first stage)	
Slug	GND	Ground	

Absolute Maximum Ratings

All voltages are referred to ground (Pins GND and slug), no RF

Parameters	Symbol	Value	Unit
Supply voltage Pins V1_PA, V2_PA, V3_PA_OUT	V_S	6	V
Junction temperature	T_J	150	°C
Storage temperature	T_{stg}	-40 to +125	°C
RF input power PA	P_{inPA}	10 dBm	dBm

Thermal Resistance

Parameters	Symbol	Value	Unit
Junction ambient, HP-VFQFP-N16	R_{thJA}	TBD	K/W

Operating Range

All voltages are referred to ground (Pins GND and slug). Power supply points are V1_PA, V2_PA, V3_PA_OUT. The following table represents the sum of all supply currents at maximum output power.

Parameters	Symbol	Min.	Typ.	Max.	Unit
Supply voltage Pins V1_PA, V2_PA, V3_PA_OUT	V_S	2.7	3.0	4.6	V
Supply current	I_S		160		mA
Standby current	I_{S_PD}		10		μA
Ambient temperature	T_{amb}	-40	+25	+85	°C

Electrical Characteristics

Test conditions (unless otherwise specified): $V_S = 3.0$ V, $T_{amb} = 25^\circ\text{C}$, $f = 2,45$ GHz, $P_{in} = 0$ dBm, CW-mode

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
1	Power Amplifier ⁽¹⁾⁽²⁾								
1.1	Supply voltage	Pins V1_PA, V2_PA and V3_PA_OUT		V_S	2.7	3.0	4.6	V	A
1.2	Supply current	TX		I_{S_TX}		160		mA	A
1.3		Power down		I_{S_PD}		10		μA	A
1.4	Frequency range	TX		f	2.4		2.5	GHz	A
1.5	Digital gain-control range	TX		ΔGp		18		dB	A

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

- Notes:
- The power amplifier shall be unconditionally stable, maximum duty cycle 100%, true CW operation, maximum load mismatch and duration TBD
 - With external matching network, $Z_{in} = Z_{out} = 50 \Omega$
 - According to Bluetooth 1.1 specification
 - Internal pull-up current source, activated with PU-signal (TX-mode)

Electrical Characteristics (Continued)

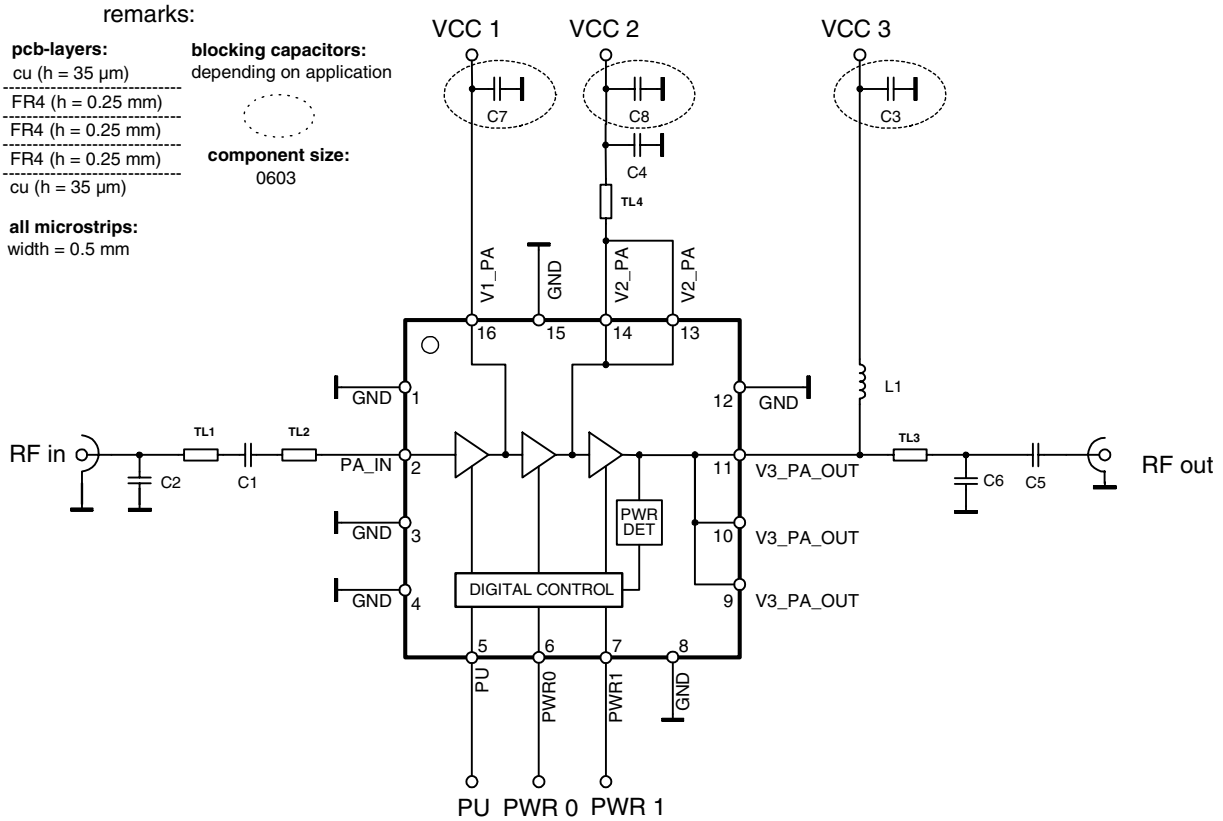
Test conditions (unless otherwise specified): $V_S = 3.0\text{ V}$, $T_{\text{amb}} = 25^\circ\text{C}$, $f = 2,45\text{ GHz}$, $P_{\text{in}} = 0\text{ dBm}$, CW-mode

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
1.6	Power gain maximum	TX, Pin PA_IN to V3_PA_OUT		Gp		23		dB	A
1.7	Isolation			Gp	17			dB	A
1.8	Power-added efficiency	TX		PAE	35	40		%	A
1.9	Saturated output power	TX		P_{sat}		23		dBm	A
1.10	Input matching ⁽²⁾	TX, Pin PA_IN		Load VSWR			2 : 1		C
1.11	Output matching ⁽²⁾	TX, Pins V3_PA_OUT		Load VSWR			2 : 1		C
1.12	Harmonic suppression at saturated output power	TX, Pins V3_PA_OUT		2 f			-30	dBc	C
1.13		TX, Pins V3_PA_OUT		3 f			-30	dBc	C
2	Power Output Level ⁽²⁾⁽³⁾								
2.1	PU = 0	PWR 1, PWR 0 x x		P_{out}			-17	dBm	A
2.2	PU = 1	PWR1, PWR0 0 0 0 1 1 0 1 1		P_{out}		5 11 17 23		dBm dBm dBm dBm	A
2.3	Step width			ΔP_{out}	-2		+2	dBm	A
3	Logic Input Levels ⁽⁴⁾								
3.1	High input level	= 1, PWR0, PWR1 and PU		V_H	2.0		V_S	V	D
3.2	Low input level	= 0, PWR0, PWR1 and PU		V_L	0		0.8	V	D
3.3	High input current	= 1, V_H at V_H		I_H		10	20	μA	A
3.4	Low input current	= 0, V_L at V_L		I_L		-10	-20	μA	A

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

- Notes:
1. The power amplifier shall be unconditionally stable, maximum duty cycle 100%, true CW operation, maximum load mismatch and duration TBD
 2. With external matching network, $Z_{\text{in}} = Z_{\text{out}} = 50\ \Omega$
 3. According to Bluetooth 1.1 specification
 4. Internal pull-up current source, activated with PU-signal (TX-mode)

Application Circuit



C1	5.6 pF AVX ACCU-P0603
C2	1.5 pF AVX ACCU-P0603
C3	1 nF
C4	3.3 pF AVX ACCU-P0603
C5	5.6 pF AVX ACCU-P0603
C6	1.5 pF AVX ACCU-P0603
C7	1 nF
C8	1 nF
J1	SMA-Connector
J2	SMA-Connector
L1	15nH Toko LLQ1608
IC1	T7025
TL1	1 mm
TL2	1 mm
TL3	3 mm
TL4	4 mm
PCB	T7025 V2.2

Application Board

Figure 3. Top View

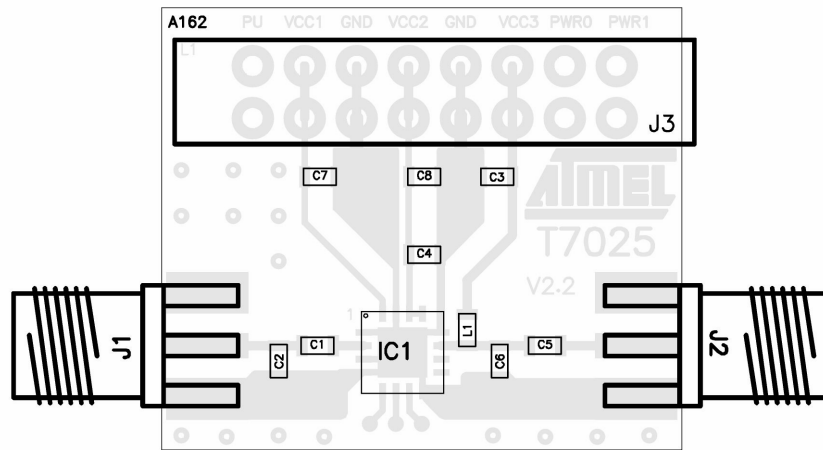
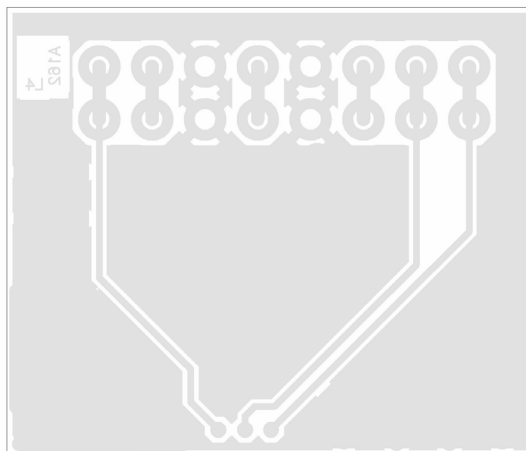


Figure 4. Bottom View



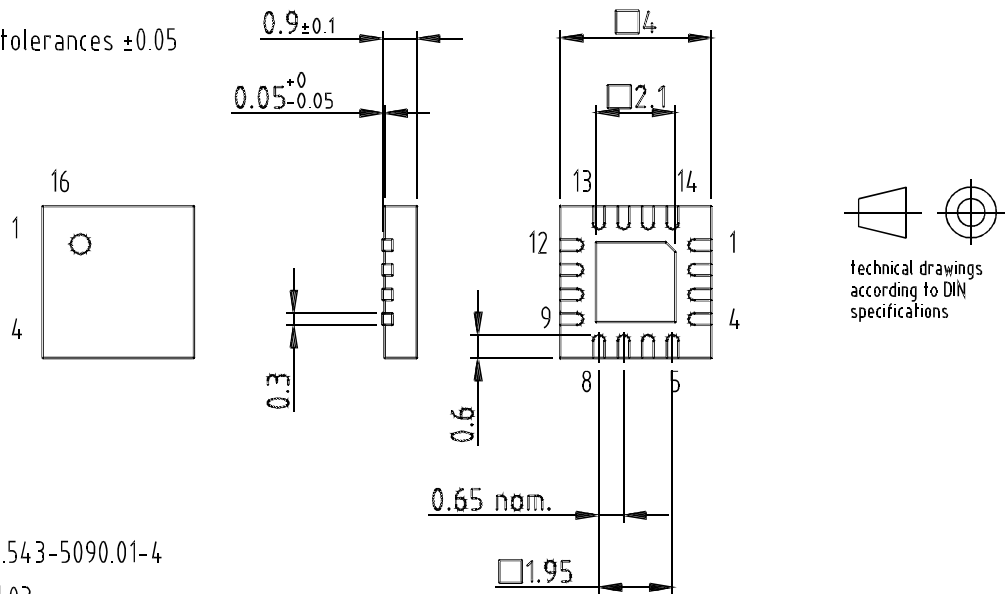
Ordering Information

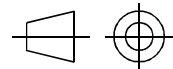
Extended Type Number	Package	Remarks
T7025-PES	QFN 16	Tube
T7025-PEQ	QFN 16	Taped and reeled

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




 technical drawings
 according to DIN
 specifications

Drawing-No.: 6.543-5090.01-4

Issue: 2; 24.01.03



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